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CLASSIFICATORY REVISIONS IN GAMMARIDEAN AMPHIPODA (CRUSTACEA), PART 1.

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Preparatory to issuing a revised edition of "The Families and Genera of Gammaridean Amphipoda" (see J. L. Barnard, 1969a) we must propose and explain a host of systematic and nomenclatural changes for which there will not be room in the forthcoming work. This is the first of several parts we intend to issue on this topic.

Type-species of the genera are cited in parentheses following the generic citations. Mathematical ratios of characters are cited only from the type-species. Contribution No. 96 of Gordan S. Karaman.

We appreciate the critical reading of our work by Dr. Wim Vader and Dr. T. E. Bowman. We also appreciate the nomenclatural suggestions (not all necessarily undertaken) of Dr. G. C. Steyskal.

Our Philosophy

As revisers attempting to reorder all 1000 gammaridean genera by a world synoptic view being prepared over a short period of time (5 years), we face the difficulty that we cannot carefully examine all 5000 species and we must therefore rely on the literature. The literature is often defective because characters are either omitted from descriptions or are inadequately described. This leads to a tendency to find intergradations and therefore to synonymize genera. In some cases, of course, outright misrepresentations can lead to the false need for splitting at the generic level.

We believe that synonymizing of genera by "armchair" revisers is a far more deleterious taxonomic practice than the creation of genera through splitting by the same revisers. Hence we are far more reluctant to synonymize genera simply by exercise of opinion as to the degrees of intergradations expressed in the known species than we are to create what may be ephemeral genera, by which process we are simply trying to clean up problems and call attention to diversity not heretofore recognized. We are especially reluctant to synonymize genera when other specialists have recently revised groups and made intelligent appraisals, but on which we see lesser clarity than they do in generic expression. Our worry is that those revisers saw the distinctions but failed to express them convincingly. Only in older revisions where species lately described clearly show intergradations for which synonymizing must be employed, do we not hesitate to lump. Our

purpose is therefore to preserve every genus we can, although, in some cases, such as the pontogammarids, we are hard pressed to find absolute discontiguity among several of the genera.

Amphipoda, like most other Crustacea, are heavily oversplit, in the opinions expressed to us by many non-carcinologists. Entomologists and botanists particularly notice oversplitting in Crustacea. We agree with them on the basis of their standards, but we maintain the crustacean tradition with the viewpoint that a diversity in names is a convenient way to express evolutionary deployment at a fine level; that splitting is digitally useful, and that evolutionary concepts can be conveniently tied to simple names rather than to phrases such as the "polycarpus section of the euphylloides group of *Eucalypitus*" (contrived statement).

Acanthonotozomatidae and Paramphithoidae

The following characters used to separate several genera are found to be useless because of transitional gradation among species assigned to several pairs or triads of those genera but not necessarily to all genera of the family complex: shape of labrum; presence or absence and number or size of teeth on mandibular incisors; presence or absence of apical notches on outer lobes of lower lip; length of palp on maxilla 1; presence or absence and size of a small fourth article on maxillipedal palp; and degree of subchelation on gnathopods already reaching the category of "simple." Nevertheless, many genera do exhibit very consistent differences in these characters and their taxonomy is not to be disturbed at this time. In the following genera newly emended we have found these characters worthless.

Acanthonotozoma Boeck, new synonymy

Acanthonotus Ross, 1835:90 (homonym, Pisces) (*Acanthonotus cristatus* Ross, 1835, original designation).

Acanthonotozoma Boeck, 1876:229, 237, 712 (new name).

Panoploeopsis Kunkel, 1910:23 (*Panoploeopsis porta* Kunkel, 1910). New synonym.

Panoploeopsis differs from the type-species of *Acanthonotozoma* in: (1) narrow labrum; (2) unnotched lobes of labium; (3) short palp of maxilla 1; (4) weakly produced article 2 of maxillipedal palp; (5) lack of article 4 on maxillipedal palp; (6) serrate dactyl of gnathopod 1.

The narrow labrum is shared with *Acanthonotozoma rusanovae* Bryazgin (1974).

Notched or entire lobes of labium and shortened palp of maxilla 1 are discounted as generic characters. These are shown to be transitional in *Iphimedia* Rathke and other genera.

The weakly produced article 2 of the maxillipedal palp is minor and the degree of extension on this article is variable in other taxa. The loss of article 4 on the maxillipedal palp is intergraded by the vestigial condition of this article in *A. rusanovae*.

The serrate dactyl of gnathopod 1 is shared with *Acanthonotozoma cristatum* (Ross).

Anchiphimedia K. H. Barnard

Anchiphimedia K. H. Barnard, 1930:357 (*Anchiphimedia dorsalis* K. H. Barnard, 1930, monotypy).

This genus is close to *Iphimediella* Chevreux but differs in the long article 2 of antenna 1, which in all the species of *Iphimediella* for which this character is described, is much shorter than article 1. The gnathopods of *Anchiphimedia* were never described but presumably are like those of *Iphimediella* (thin and chelate). Until the type-species of this genus is redescribed the value of short article 2 on antenna 1 coupled with short palp of maxilla 1 must be maintained as distinctions from *Iphimediella*.

Cypsiphimedia stegosaura (Griffiths), new combination

Panoploea stegosaura Griffiths, 1975:100–102, fig. 2.

The genus *Panoploea* is now a synonym of *Iphimedia* (see below) but *P. stegosaura* is almost identical to the type-species of *Cypsiphimedia, C. gibba* K. H. Barnard (1955), in length of pereonite 1, mouthparts, gnathopods and head. *Cypsiphimedia stegosaura* differs from *C. gibba* only in the numerous dorsal processes of the body and the teeth of epimera, coxae and posterior pereopods. *Cypsiphimedia* differs from *Iphimedia* (=*Panoploea*) in the elongate pereonite 1 which is as long as or longer than pereonites 2–4 combined. The 2 species of *Cypsiphimedia* bear the short palp of maxilla 1 like certain species of *Iphimedia*. Though K. H. Barnard (1955) remarked on the lack of processes in *C. gibba* as uncharacteristic of the family group and therefore worth generic valuation, the similarities between *C. gibba* and *C. stegosaura* are too numerous to segregate *C. stegosaura* on the basis of processes, especially in light of the presence of only 2 species in the genus.

Epimeria Costa, new synonymy

Epimeria Costa in Hope, 1851:46; Stebbing, 1906:321 (*Epimeria tricristata* Costa in Hope, 1851, monotypy, =*Gammarus corniger* J. C. Fabricius, 1779).

?*Vertumnus* White 1847 (nomen nudum).

Subepimeria Bellan-Santini, 1972:225 (*Subepimeria geodesiae* Bellan-Santini, 1972, monotypy). New synonym.

Subepimeria Bellan-Santini is supposed to differ from *Epimeria* on the presence of an accessory flagellum and fully simple gnathopods but the type-species of *Epimeria* was said by Stebbing (1906:323) to bear the same kind of accessory flagellum (overlooked by J. L. Barnard, 1969a, in his diagnosis of *Epimeria*) and apparently a similar situation prevails in *E. loricata* Sars.

The so-called simple gnathopods of *Subepimeria* in reality have extremely weak palms and are intergraded to other species of *Epimeria* by *E. inermis* Walker (see Bellan-Santini, 1972: plate 32). Absolutely simple palms occur in a very closely similar genus, *Pseudepimeria* Chevreux (1912a, b) on which the gnathopodal dactyls are swollen and grossly spinose. This condition is intergraded by such species as *Subepimeria geodesiae* and *E. inermis* both of which have weak palms and falciform dactyls with large cusps or spines. *Pseudepimeria* must therefore be evaluated from time to time as a possible synonym of *Epimeria*.

Epimeria yaquinae McCain

Epimeria yaquinae McCain, 1971:162, figs. 2–3.

The gnathopods of this species are enlarged, the wrists are short and the palms bear a large defining tooth; these gnathopods are very distinct from those of the type-species of *Epimeria,* and from most other species of the genus, but *E. pelagica* Birstein and Vinogradov (1958), also has short wrists though the hands are not thickened. A graded series of gnathopods occurs from *E. loricata* Sars to *E. cornigera* (J. C. Fabricius) to *E. pelagica* and then to *E. yaquinae*. For this reason we are not distinguishing *E. yaquinae* generically from *Epimeria*.

Epimeriella Walker, new synonymy

Epimeriella Walker, 1906:17 (*Epimeriella macronyx* Walker, 1906, monotypy).

Eclysis K. H. Barnard, 1932:181 (*Eclysis similis* K. H. Barnard, 1932, monotypy). New synonym.

The type-species of *Eclysis* differs from the type-species of *Epimeriella* in: (1) the slightly broader outer plate of the maxilliped; (2) the slightly shorter palp articles 3–4 of the maxilliped; (3) the produced or weakly lobate article 5 of gnathopod 1; (4) more elongate pereopod 7, said to be as long as or longer than pereopod 6, whereas in *Epimeriella* pereopod 7 is shorter than pereopod 6; and (5) the ovate article 2 of pereopod 5, being much more linear in *Epimeriella*.

The differences in maxilliped are judged inconsequential.

The alternatives of produced and unproduced article 5 of gnathopod 1 are intergraded by *Epimeriella scabrosa* K. H. Barnard.

The differences in length of pereopods 6 and 7 are transcended by *E. scabrosa* and *E. walkeri* K. H. Barnard.

After the other characters are disposed of, the difference in shape of article 2 on pereopod 5 does not appear to warrant generic segregation of *Eclysis*.

Iphimedia Rathke, new synonymy

Iphimedia Rathke, 1843:85 (*Iphimedia obesa* Rathke, 1843, monotypy).
Microcheles Krøyer, 1846:58, 66 (*Microcheles armata* Krøyer, 1846, monotypy, =*Iphimedia obesa*).
Iphimedia obesa).
Panoploea Thomson, 1880:2 (*Panoploea spinosa* Thomson, 1880, selected by J. L. Barnard, 1969a). New synonym.
Iphimediopsis Della Valle, 1893:585 (*Iphimediopsis eblanae* Bate, 1857, monotypy).

The type-species of *Panoploea* differs from the type-species of *Iphimedia* in: (1): slightly elongate labrum; (2) stout body of mandible; (3) short palp of maxilla 1, failing to reach apex of outer plate.

The shape of the labrum is variable within each genus.

The shape of the mandible forms a continuum from very stout and short (*obesa* Rathke) to weakly slender (*jugoslavica* G. S. Karaman) to moderately slender (*haurakiensis* Hurley) to very slender (*joubini* Chevreux, *spinosa* Thomson and *grossimana* Ledoyer).

The length of the palp of maxilla 1 varies from long (*obesa* Rathke, *capicola* K. H. Barnard, *orchestimana* Ruffo) to medium (*discreta* Stebbing, *gladiolus* K. H. Barnard, *grossimana* Ledoyer, *jugoslavica* G. S. Karaman) and then progressively shorter through the series (*spinosa* Thomson, *minuta* Sars, *excisa* K. H. Barnard, *multidentata* Schellenberg, *rickettsi* Shoemaker, *macrocystidis* K. H. Barnard, *eblanae* Bate, *joubini* Chevreux, and *bidentata* Nicholls).

In addition, the labium varies from broad to narrow and from notched to unnotched in varying degrees.

Iphimediella Chevreux, new synonymy

Iphimediella Chevreux, 1911:1167; 1912a:119 (*Iphimediella margueritei* Chevreux, 1912b, monotypy).
Pariphimediella Schellenberg, 1931:121 (*Iphimedia serrata* Schellenberg 1926, designated by Schellenberg, 1931). New synonym.

Pseudiphimediella Schellenberg, 1931:119 (*Iphimedia nodosa* Dana, 1853, monotypy). New synonym.

When establishing *Pariphimediella* in a short diagnosis, Schellenberg (1931:121) stated: "Wie *Iphimediella* . . . , jedoch die Hauptschneiden beider Mandibeln mehrzähnig," but this contradicts his description of the type-species (1926:329) when he stated: "Die zugespitzte Schneide der einen Mandibel trägt 5 Zähne, ... An den andern Mandibel sind die Zähne der Hauptschneide undeutlicher." Apart from this character Schellenberg (1931) mentioned only that the lacinia mobilis (meaning left apparently) was broad and multitoothed and the lower lip distally rounded or weakly incised.

When establishing *Pseudiphimediella,* Schellenberg (1931:119) distinguished it only from *Pariphimediella* by the deeply incised upper lip and the broadened articles 1–2 of the maxillipedal palp. He otherwise only noted that the lobes of the lower lip were broadly rounded.

The numerous species to be assigned to *Iphimediella* show a wide range in: mandibular toothing or denticulation, bulkiness of mandible, incisions of upper and lower lips. The width of basal articles on the maxillipedal palp is variable in neighboring genera (*Acanthonotozoma* Boeck, *Iphimedia* Rathke) and is discounted as a clear generic character.

Labriphimedia K. H. Barnard, new synonymy

Labriphimedia K. H. Barnard, 1931:427 (*Labriphimedia vespuccii* K. H. Barnard, 1931, original designation).

Maoriphimedia Hurley, 1954:771 (*Maoriphimedia hinemoa* Hurley, 1954, original designation). New synonym.

Maoriphimedia differs from *Labriphimedia* in: (1) the quadrate labrum weakly incised distally; (2) the incised outer lobes of the labium and (3) the 3-articulate palp of the maxilliped.

The labrum of *Labriphimedia vespuccii* is twice as broad as long and bears a convex dilation distally. The labrum of *Maoriphimedia hinemoa* is quadrate, distinctly broader than long and weakly incised distally. The labrum of *L. pulchridentata* (Stebbing) is intermediate between these extremes; it has a straight distal margin but is subrounded as in *vespuccii* and is as long as in *hinemoa*. Within other genera of unquestioned validity such as *Echiniphimedia* K. H. Barnard and *Iphimediella* Chevreux as based on characters other than these being discussed, the labrum varies from entire to weakly incised in the several species.

Apical notching on the outer lobes of the lower lip is a variable character in such genera as *Acanthonotozoma* Boeck and *Panoploea* Thomson (*sensu auctorum* prior to their amalgamation).

When article 4 of the maxillipedal palp is present in *Labriphimedia* it is

minute, in vestigial form. In other good genera such as *Acanthonotozoma* this small difference is not accorded generic value; for example, article 4 is well developed in *A. serratum* (J. C. Fabricius) and vestigial in *A. rusanovae* Bryazgin.

Pleustidae

Mandibular molars in Pleustids.—Genera of pleustids heretofore have been distinguished on the condition of the mandibular molar; for example, the molar of *Stenopleustes* Sars is large, columnar and strongly triturative, whereas that of *Pleustes* Bate is small, conical, spinose or not, but not distinctly triturative. However a transitional form of molar occurs in such species as *Sympleustes corniger* Shoemaker (1964). This molar is elongate, subconical and bears a weakly triturative apex. Further study of this kind of molar is required and many pleustids must be reexamined for molar conditions. Until the group can be monographed we are removing such species with intermediate molar to genera with feeble or nontriturative molar.

Arctopleustes glabricauda (Dunbar), new combination

Parapleustes glabricauda Dunbar, 1954:754–756, figs. 25, 26.

This species is removed to *Arctopleustes* because of the large process on palp article 3 of the maxilliped but more importantly because of the shape of the gnathopods which conform to the type-species of *Arctopleustes*. Gnathopod 1 is slender, article 5 longer than article 6 and without posterior lobe. Gnathopod 2 is stout, with short and lobed article 5.

Dactylopleustes, Karaman and Barnard, new genus

Type-species.—*Parapleustes echinoicus* Tzvetkova, 1975b.

Diagnosis.—Rostrum reaching about halfway along article 1 of antenna 1. Labrum incised. Mandibular molar obsolescent. Outer lobes of labium gaping, inner lobes mostly coalesced. Maxilla 1 ordinary but apices of maxilla 2 spinose. Dactyl of maxilliped well developed, apical half of inferior margin combed, article 3 lacking distal process. Gnathopods 1–2 subchelate, slender, article 5 almost as long as article 6, unlobed. Dactyl of pereopods 3–7 swollen, bearing large inferior distal notch and serrate or tuberculate inferior margin. Epimeron 3 with unserrate posterior margin. Uropods 1–3 ordinary, outer ramus shorter than inner. Telson entire.

Relationship.—The unusual, perhaps prehensile dactyls of pereopods 3–7 and the very stout spines on maxilla 2 distinguish this unique species from the many species of *Parapleustes* Buchholz.

Species.—*echinoicus* (Tzvetkova, 1975b).

Tepidopleustes, Karaman and Barnard, new genus

Type-species.—*Parapleustes barnardi* Ledoyer, 1972.

Name.—Both species of the genus occur in warm-temperate waters either in the Mediterranean Sea or in Hawaii and hence the appellation "tepido," meaning "lukewarm" is applicable to the generic name. Masculine.

Diagnosis.—Rostrum not exceeding half of length of article 1 on antenna 1. Labrum incised. Mandibular molar conical, feeble, nontriturative. Outer lobes of labium gaping, inner lobes partly coalesced. Maxillae ordinary. Dactyl of maxilliped reduced in size or absent, when present then article 3 of palp produced. Gnathopods 1–2 subchelate, slender, article 5 longer than article 6 and unlobed. Pereopods 3–7 ordinary. Epimeron 3 with multiserrate convex posterior margin. Uropods 1–3 ordinary, outer ramus shorter than inner. Telson entire.

Relationship.—This genus differs from all other pleustid genera in the multiserrate epimeron 3 and in the reduced or absent dactyl of the maxilliped. *Tepidopleustes* appears to be closely similar to *Neopleustes* Stebbing because of the thin gnathopods and produced article 3 of the maxillipedal palp in the type-species, *T. barnardi,* but the elongate article 5 of the gnathopods and the serrate epimeron 3 are strong distinctions.

Species.—*barnardi* (Ledoyer, 1972), ?*honomu* (J. L. Barnard, 1970); Mediterranean Sea and Hawaii, littoral or sublittoral, 2.

Parapleustes corniger (Shoemaker), new combination

Sympleustes cornigera Shoemaker, 1964:408–410, fig. 9.

In accordance with comments on mandibular molar (above), this species, with conical molar bearing weak triturative surface, is removed to *Parapleustes.*

Parapleustes? *euacanthoides* (Gurjanova), new combination

Neopleustes pulchellus euacanthoides Gurjanova, 1972:163–165, figs. 18, 19.

This species is quite distinct from *N. pulchellus* and does not belong to *Neopleustes* because article 3 of the maxillipedal palp lacks a strong process. The mandible is not described and coxae 1–4 are acuminate. For the moment the species can be placed in *Parapleustes* but it may require erection of a new genus. The coxae resemble those of *Mesopleustes* Stebbing.

Parapleustes gagarae (Gurjanova), new combination

Stenopleustes cornigera gagarae Gurjanova, 1972:160–162, figs. 16, 17.

This species differs from *P. corniger* in the smallness of dorsal tooth on pleonite 3 and the absence of a posteroventral tooth on epimeron 3. The

weakness of the apicolateral process on article 3 of the maxillipedal palp forces removal of these two species to *Parapleustes*.

Pleustes Bate

Pleustes Bate, 1858:362.—Stebbing, 1906:309.—Gurjanova, 1972:131, 141.

This genus and *Parapleustes* Buchholz are redefined. The two genera differ only by the large rostrum of *Pleustes* and the small rostrum of *Parapleustes*. The rostrum of *Pleustes* extends beyond the apex of article 1 on antenna 1 whereas the rostrum of *Parapleustes* reaches 40 percent or less along article 1 of antenna 1. All other attributes of the two genera are either alike or transcended by intergrading species.

Pleusymtes coquilla J. L. Barnard

Pleusymtes coquilla J. L. Barnard, 1971:74, figs. 47, 48.

This species and *P. ochrjamkini* (Bulycheva, 1952) have coxa 1 slightly shortened and slightly bent forward as in *Pleustomesus,* but both species differ from *Pleustomesus* in the short rostrum.

Eusiridae

Paracalliopiella Tzvetkova and Kudrjaschov, new synonymy

Paracalliopiella Tzvetkova and Kudrjaschov, 1975:14 (*Leptamphopus litoralis* Gurjanova, 1938, original designation).

Callaska J. L. Barnard, 1978:33 (*Calliopiella pratti* J. L. Barnard, 1954, original designation). New synonym.

Barnard did not see Tzvetkova and Kudrjaschov's paper until after *Callaska* was printed. The type-species of the two genera clearly are congeneric as shown by Tzvetkova and Kudrjaschov, even to the special sexual dimorphism of the gnathopods.

Besides the taxal comparisons made by J. L. Barnard (1978), *Paracalliopiella* has similarities to *Pontogeneiella maneroo* J. L. Barnard (1972), but differs in the weaker setation on the inner plate of maxilla 1, the presence of an articulate accessory flagellum, and the absence of an accessory blade on the pereopodal dactyls.

Paracalliopiella differs from *Apherusa* only in the presence of a distinct accessory flagellum.

Liljeborgiidae

Idunella Sars, new synonymy

Idunella Sars, 1895:536.—Stebbing, 1906:234 (*Liljeborgia aequicornis* Sars, 1876, monotypy).

Sextonia Chevreux, 1920:76 (*Sextonia longirostris* Chevreux, 1920, monotypy).

Ronconoides Ledoyer, 1973:59 (*Ronconoides brevicornis* Ledoyer, 1973, original designation). New synonym.

Ronconoides brevicornis is simply another species of *Idunella*.

Ampithoidae

Pseudoamphithoides Ortiz, new synonymy

Pseudoamphithoides Ortiz, 1976:3 (*Pseudoamphithoides bacescui* Ortiz, 1976, original designation).

Amphyllodomus Just, 1977:229 (*Amphyllodomus incurvaria* Just, 1977, original designation). New synonym.

Although the two type-species, the first from Cuba and the second from the Barbados, appear distinct, they clearly represent the same unusual genus. Barnard and Zimmerman (1976) saw specimens of the genus from Puerto Rico in 1975 and had the same difficulty initially placing the genus in a family that the above authors remark about. We have withdrawn our contemporaneous workup of the genus.

Pseudoamphithoides is a member of Ampithoidae but differs in the narrowness on the inner ramus of uropod 3 which is, overall, more like *Paragrubia* than the ordinary ampithoid with flabellate rami. The notched outer lobes of the lower lip confirm the ampithoid affinity as against a corophiid affinity.

The following distinctions stated for *P. incurvaria* would seem to separate it from *P. bacescui*: 1, smaller eye; 2, narrower inner plate of maxilla 1; 3, more spines (8) on the outer plate of maxilla 1 (5 on *bacescui*); 4, broadened outer plate of maxilla 2; 5, setose posterior margin of article 2 on pereopod 4; 6, many more directly marginal spines on the rami of uropods 1–2; 7, presence only of setae and absence of spines on apex of inner ramus on uropod 3.

These differences may actually result from differences in rendition of the species by the two authors.

Gammaridae

The Pontogammarus *Group in the Caspian Sea.*—Because of their complicated geological history, the modern remnants of the Pontocaspian Basin contain a complex fauna of several elements: normal marine (*Pseudalibrotus*)[1], coastal brackish marine (*Corophium*)[1], and freshwater elements de-

[1] Actually *Pseudalibrotus* (=*Onisimus*), like *Corophium*, appears to qualify as a brackish coastal marine genus.

rived from indigenous genera such as *Echinogammarus* (=*Chaetogammarus*) or from those swept in from far places such as Lake Baikal (none as yet specifically identified)[2]. The marine elements may come from the Arctic (*Gammaracanthus* and *Pseudalibrotus*)[3] or from the subtropics (*Corophium*) but the main group of Pontocaspian genera is that now called the *Dikerogammarus* or *Pontogammarus* group which appears to have close affinities to the widespread European genus *Echinogammarus* and its allies. The *Pontogammarus* group comprises many genera characterized by the ventral lobation on the basis of pereopod 7 which has several intergradational genera and species emerging from *Echinogammarus*: (for example, *E. warpachowskyi, Yogmelina, Amathillina*). This group has analogous, perhaps homologous connection to taxa in the *Micruropus* group of Lake Baikal but generally the taxa in the Pontocaspian basin retain more primitive characters than those now found in Baikal. One may theorize also that, because of the immense amount of convergence and parallelism in amphipods demonstrated elsewhere (as between marine and freshwater), Baikalian and Pontocaspian faunas may be parallel but mostly unconnected microcosms. Whether or not the allied group of *Echinogammarus* (=*Chaetogammarus* and *Marinogammarus*) might have had a marine origin because the "*Marinogammarus*" members today live in holarctic coastal marine waters is a moot point. One of us (Barnard) believes that the marine members of *Echinogammarus* and *Gammarus* invaded the sea from freshwater and were never a well developed marine group because of the constrained bathymetric range they now enjoy. They could then have invaded the fluctuating environments of the Pontocaspian basin just as well as the great ocean and become adapted to the many salinities prevailing over the millenia.

Today the aquatic remnants of the Pontocaspian Basin are the Aral Sea, the Caspian Sea, the Sea of Azov and the Black Sea, and their river systems, which today support a variety of salinities mostly from fresh to pleiomesohaline but also to polyhaline. But the larger basin was at one time part of the Tethys Ocean and then a euxinic sea.

The first great student of Pontocaspian amphipods was G. O. Sars who in papers published between 1894 and 1897 described many species and several new genera, but retained most of the pontogammarid taxa in the genus *Gammarus*. A great contemporary, Sowinsky, pulled many of these away into *Pontogammarus* and other students such as Martynov, Carausu, Birstein, and Derzhavin continued to describe new genera based on new species or carved out new genera from previously described species. Fi-

[2] But analogous genera such as *Micruropus* and *Pachyschesis* occur in Baikal.

[3] *Gammaracanthus* is a prominent glacial lakes genus.

nally, Stock (1974) organized 12 genera and one additional subgenus into a *Dikerogammarus-Pontogammarus* complex.

Stock carefully segregated these genera from other Pontocaspian elements by their possession of a ventral lobe on the expanded basis of pereopod 7 and by the criterion that gnathopod 1 could not be larger than gnathopod 2. The character of pereopod 7 segregated them from such mundane genera as *Gammarus, Chaetogammarus* and *Echinogammarus* and from such Caspian elements as *Cardiophilus, Gmelina* and *Axelboeckia* but the gnathopodal definition separated them from such genera as *Iphigenella*. Actually several species in the *Echinogammarus* taxa of the region have article 2 of pereopod 7 constructed in a form intermediate between typical *Echinogammarus* and *Dikerogammarus* (see above) and hence connections between the gammarids (sensu stricto) and pontogammarids are preserved in the region. Species like *Niphargoides corpulentus* have poor ventral lobation on pereopod 7. We are not strong believers in the gross taxonomic value of reversal in dominance of gnathopods from gnathopod 2 to gnathopod 1 as indicating any kind of monophyletic cohesion valued higher than at generic level so that we would transfer into the pontogammarids those genera with enlarged gnathopod 1 otherwise qualified on pereopod 7.

Despite the many studies of Pontocaspian Amphipoda and the elegant work of Stock, the genera remain somewhat clouded and not fully discrete. There is a great deal of internal diversity in the genera (variant species) and some of the crucial characters of the type-species of several genera have not been confirmed. For example, Stock had to make several assumptions because he did not see the mouthparts of taxa such as *Niphargoides quadrimanus*[4] (type of *Niphargogammarus*) and based the mandibular condition on a secondary species, *Niphargoides intermedius*. To preserve *Paraniphargoides* and segregate it from *Niphargogammarus* we have to overlook the absurdity that the only good difference at the moment between the two genera is the presence or absence of discrete D setae, which, themselves, are on the inner edge of the third article on the mandibular palp and not simply near the apex. The alternatives of this character condition are mixed together in other genera, for example, *Pontogammarus borceae* and *P. aestuarius*. But until the type-species of *Niphargogammarus* can be examined we must reserve synonymizing of *Niphargogammarus* and *Paraniphargoides* because some other good character may come to light.

Pontogammarization.—Pontogammarization is a feature long noted of Pontocaspian amphipods, though by no means all taxa in the basin are pontogammarized. It is a condition also found in a limited number of Baikalian taxa and is familiar to marine taxonomists as fossorialization or ad-

[4] We conclude this from internal evidence.

aptation to the burrowing mode of existence. In freshwater Amphipoda this has always been an unusual feature because only in the largest muddy basins such as the Caspian Sea did taxa such as these occur. But adaptations similar in extent are now being recognized in a few of the lacustrine and hypogean taxa though there can be wide confusion as to the function of a so-called fossorial adaptation. We particularly call attention to the heavily setose pereopods 3–4 of the sarothrogammarid and "hairy" echinogammarus groups which resemble those of fossorial amphipods but for which we think are used as filtering devices rather than burrowing mechanisms.

The extreme case of pontogammarization, or fossorial adaptation, in the Pontocaspian basin is found in genera such as *Niphargogammarus* (in the *Niphargoides* group of 5 genera). Here the antennae are very short, the flagella very short and powerful, the peduncles very stout and heavily setose; pereopods 3–7 are very stout and heavily setose; epimeron 3 bears a fan of setae; and uropod 3 is short and stout and heavily setose or spinose. The strongest lobation on article 2 of pereopod 7 appears to be associated with other strong fossorial characters though we know nothing of its function. Antennal articles may become humped.

One may imagine the opposite conditions to these as those belonging to a simple nestling animal such as *Gammarus* sp., with long graceful antennae, and with pereopods and uropods bearing only moderate densities of setae. In the Caspian Sea almost all stages between the simple *Gammarus* form (as represented by the *Chaetogammarus* section of *Echinogammarus*) and the *Niphargoides* form are found. Besides these simple evolutionary stages we also appear to confront cases of neotenization in which apomorphic taxa of secondarily simplified form probably descended from heavily pontogammarized taxa through the evolutionary procedure of neoteny (better defined as heterochrony or pedogenesis applied to amphipods because these animals lack larvae). For example, *Akerogammarus* appears to be a neotenic derivation of the pontogammarid line, though the genus might be interpreted to be a perfect intergrade between "*Gammarus*" and "*Pontogammarus*." However the dwarf body size is a tenacious clue.

Description of Pontogammarid Characters

Antenna 1.—Three kinds of antenna 1 were recognized by Stock (1974) though none of them is clearly discontiguous from another.

Gammarus (Dikerogammarus): Antenna 1 elongate, slender, peduncular articles slightly shorter and slightly narrower in succession, main flagellum much longer than peduncle but accessory flagellum much shorter than primary flagellum.

Pontogammarus: Peduncle stouter than in *Gammarus* type, article 2 only half as long as article 1, strong distinction in width between articles 1 and

2, main flagellum just slightly longer than peduncle, accessory flagellum just slightly less than half as long as main flagellum.

Niphargoides: Peduncle stouter than in *Pontogammarus* type, article 1 also elongate, generally longer than articles 2–3 combined, article 2 even shorter, often humped ventrally, primary flagellum shorter than peduncle (usually shorter than article 1), accessory flagellum more than half as long as primary flagellum.

An almost perfect intergrade between the *Gammarus* and *Pontogammarus* kinds of antenna 1 occurs on *Turcogammarus spandli* (S. Karaman) where article 2 of the peduncle is precisely half as long as article 1 but not strongly narrower than article 1. An almost perfect intergrade between the *Pontogammarus* and *Niphargoides* kinds of antennae occurs on *Baku paradoxus* where the primary flagellum is actually shorter than the peduncle and the accessory flagellum is about 40 percent as long as the primary flagellum. The strongest *Niphargoides* antenna 1 is fully setose ventrally on article 1 and article 2 is strongly humped (*Niphargogammarus*) but many transitional stages occur towards the *Pontogammarus* kind by reduction of setae and humps.

ANTENNA 2.—Three kinds of antenna 2 can be recognized, Stock having differentiated between a *Pontogammarus* and a *Stenogammarus* form.

Gammarus (Dikerogammarus, Pontogammarus): peduncular article 3 short, articles 4–5 elongate, slender, subequal, clearly distinct from flagellum.

Niphargoides: Articles 4–5 of peduncle scarcely longer than article 3, one or more of these articles humped, articles of flagellum short so that flagellum and peduncle remain distinct.

Stenogammarus: Article 4 of peduncle clearly distinguishable as main article, article 3 variable, article 5 shorter and thinner than article 4, flagellar articles sufficiently elongate relative to article 5 that first 2 articles together generally longer than article 5 of peduncle; hence a gradation occuring between article 4 and flagellum so as to obscure article 5 as member of either peduncle or flagellum.

Transitional forms between the *Gammarus* and *Stenogammarus* forms are found in *Euxinia sarsi* and *E. maeoticus*. To be intermediate article 5 must be shorter and/or narrower than article 4, thus with smaller lateral surface area. Actually the ratio in area of each of the type-species of *Pontogammarus* and *Stenogammarus* (*robustoides* and *macrurus*) of article 4 to article 5 is 14:10 and 16:10, scarcely enough difference to make a mathematical distinction of any lasting value in light of such species as *E. sarsi*.

MANDIBULAR PALP.—Article 3 is either semifalcate as in *Gammarus* or of much more linear form. In the falcate kind the ventral margin of article 3 is curved and setose (bearing D setae) whereas in the linear kind any D setae, if at all present, are confined apically in partnership with normally

terminal E setae. Sometimes D and E setae are strongly distinct because D setae are short and E setae are long, but in other cases (*Euxinia maeotica*) the E setae are short and indistinguishable.

Stock (1974) makes generic distinctions on characters of mandibular palp article 3 in couplet 10 of his generic key (p. 81) by which *Niphargogammarus* and *Paraniphargoides* are separated. *Paraniphargoides* is thus compared to and then distinguished from *Niphargoides* whereas, in our opinion, *Paraniphargoides* should be allied to *Niphargogammarus*. The two genera are distinguished in qualitative means only by the presence of D setae on mandibular palp article 3 in *Paraniphargoides*. The other characters of size on antenna 2 and uropod 3 are too quantitative and difficult to define mathematically so as to afford good distinctions between the genera. In any event, article 3 of the mandibular palp is unknown in the type-species of *Niphargogammarus*.

The two fullest extremes of mandibular palp article 3 are found in *Pontogammarus*, the falcate kind with DE setae in *aestuarius* and the curved linear kind with only E setae in *borceae* which would suggest the low value of these alternatives as a generic character.

Labium.—Inner lobes are present or absent or in all degrees of transition between the two alternatives in pontogammarids. In many other gammarid groups the extremes of presence or absence have generic value but the situation is too poorly known in pontogammarids to evaluate at the moment.

Maxilla 1.—The inner plate is usually fully setose medially. The palps are generally asymmetric, right or left sides. One side or the other usually bears stronger spines than the other, or partially bears teeth rather than spines. However, symmetrical palps are found in *Cardiophilus* and though that genus is inquilinous, such character cannot be attributed to that ecological mode because the symmetric condition is also found in such non-Pontocaspian genera as *Jugogammarus* and *Fontogammarus*.

Maxilla 2.—The oblique facial row of setae on the inner plate appears to be present in most pontogammarid genera in varying degree of completeness but many species remain unstudied for this character.

Gnathopods.—Stock includes in *Dikerogammarus-Pontogammarus* taxa only those genera with gnathopod 1 equal to or smaller than gnathopod 2. We consider those taxa with gnathopod 1 enlarged as also belonging to the group if pereopod 7 qualifies as ventrally lobate. Gnathopod 2 may become smaller and smaller in evolutionary sequences, becoming thinner and more elongate (like Baikalian *Eulimnogammarus*). Karaman (1977) has found no particular generic value to the stages of miniaturization of gnathopod 2 though we value clear cases of dominance reversal in gnathopods as indicating generic distinction. Some genera, such as *Amathillina*, clearly show, on a microscopic scale, a dominance of gnathopod 1 which has gone unrecognized, but *Amathillina* otherwise is distinctive from its congeners.

Therefore the microscopic gnathopodal dominance is better used to note the affinities of *Amathillina* rather than as a notable generic character.

COXAE.—Generally these are of the *Gammarus* kind in which coxa 1 is almost identical to coxa 2, quadratiform, and coxa 4 is strongly lobed posteriorly but coxae 1–4 are well setose ventrally in contrast to *Gammarus*. Many pontogammarid coxae 1–4 are rather strongly rounded ventrally in contrast to *Gammarus* and in such taxa as *Pandorites podoceroides* and *Obesogammarus platycheir,* coxa 1 is much narrowed; in the latter species coxa 2 also tapers strongly; at the other extreme coxa 1 is dilated in *Euxinia compressa*.

The loss of long setae on coxae 1–4 is particularly evident in most species of *Dikerogammarus* and is a main characteristic of *Akerogammarus* (in combination with loss of setae elsewhere). In this and other characters *Akerogammarus* is among the least specialized of the pontogammarids and might be considered plesiomorphic if its species were not miniaturized and uropod 3 parviramous. Because uropod 3 is variramous in *Euxinia* a better plesiomorphic state is adduced and the miniaturization of species in *Akerogammarus* suggests neoteny and therefore apomorphy. Absence of coxal setae is not taken by itself as a generic character and is probably plesiomorphic in *Dikerogammarus* (species of large body size), though at least 2 species otherwise assignable to *Dikerogammarus, D. spandli* and *D. turcarum,* have long coxal setae in addition to their other unusual features such as pontogammarid antenna 1. These two species are removed to a new genus, *Turcogammarus*.

PEREOPODS 3–4.—The pontogammarized or fossorial condition is found in those species with enlarged articles 4–5 on which numerous posterior setae are present. A similar condition is found in certain species of *Echinogammarus* or in the *Sarothrogammarus* group but presumably the setae are stiffer in the *Pontogammarus* group and may be used for digging rather than filtration. Stock found 2 kinds of setal distribution on article 4 of pereopod 4 in the pontogammarids, those in which the posterior setae are grouped into bundles and those in which the setae are attached in a continuous row or fan. Stock used this character to separate *Pontogammarus* (fan) from *Obesogammarus* (bundled). Our interpretation of this usage varies according to our view of the published illustrations of several species so that our generic compositions differ from those of Stock. Actually this character has very limited value as so much intergradation occurs on article 4 of pereopod 3 and on article 5 of both pereopods 3 and 4; one must note that the bundled and continuous alternatives for generic value apply only to article 4 of pereopod 4. Karaman (1977) has recently found setation in *Echinogammarus* and *Chaetogammarus* to be so variable that the genera must be synonymized. We therefore doubt that the *Obesogammarus* distinction can be maintained.

Pereopods 5–7.—In the ordinary *Gammarus* kind of representation, article 2 of pereopods 5–7 is weakly expanded basally, then tapers distally, lacks significant ventral lobation, often has the posterior margin weakly excavate or sinuous, and the posterior setation is minimal.

In the pontogammarized amphipod, article 2 of pereopod 7 is broadly expanded and ventrally lobate, and in many of the taxa the posterior margin is strongly setose. Article 2 of pereopods 5–6 usually remains as in *Gammarus* though often the posterior margin is strongly setose. In a few genera such as *Shablogammarus* article 2 of pereopods 5–6 also becomes widely expanded and ventrally lobate.

Pleonal epimera.—Epimeron 3 consistently bears or lacks a posteroventral fan of setae on the face in genera related to *Niphargoides*. As yet no intergradation has been found in this character.

Uropods 1–2.—These are powerful in the pontogammarized species, with thick rami, the outer rami often slightly shortened and lacking marginal (dorsal) spines. Uropod 1 often has a row of basofacial setae on the peduncle and both uropods 1–2 have dorsal peduncular setae (which is a rare attribute in gammarid amphipods but prevalent in crangonyctids of southern lands).

Uropod 3.—Stock defined three kinds of uropod 3. We know these are applicable to nearctic gammarids but many other kinds of diversity occur in uropod 3 in other situations. None of the three kinds below is linked to pontogammarization in particular. We here alter Stock's definitions which appear confused because virtually the same definition is made for magniramous and variramous.

Magniramous: Inner ramus more than two-thirds as long as article 1 of outer ramus; inner ramus with marginal setae or spines.

Parviramous: Inner ramus less than one-third as long as article 1 of outer ramus; inner ramus with only terminal armaments.

Variramous: A variable between magniramous and parviramous in which the inner ramus is either between one-third and two-thirds as long as the outer ramus or in which the short inner ramus has side marginal armaments. Term can also be applied to describe the variability found in several species of a genus in which magniramous and variramous uropod 3 are found or in which parvi- and variramous kinds are found. Generally amphipodologists will not permit a genus to vary between fully parviramous and fully magniramous.

Article 2 on the outer ramus of uropod 3 is almost universally present in pontogammarids but it varies from elongate to vestigial. In a few situations, such as in *Stenogammarus*, the main generic character is an elongate article 2 on uropod 3, but we fear this usefulness is damaged by much variability, especially in juveniles, and will not hold up in the future.

We have used the variramous condition to resurrect *Euxinia* out of *Pontogammarus* for the sake of consistency in amphipodan taxonomic practice,

but feel that it is as shallow a distinction as that involving article 2. However the precedent is immensely strong because it is the only distinction now left between *Gammarus* and *Echinogammarus*.

The only faint case of pontogammarization we can find in uropod 3 of pontogammarids involves those species with extremely setose or spinose uropod 3 or in the presence of marginal setae on article 2 (a rare occurrence in amphipods) but in no case can we make out any generic value in these attributes.

Urosomites.—In *Dikerogammarus* urosomites 1–2 or 1–3 are elevated dorsally into knobs (pegs, tubercles) which usually are strongly spinose apically. This kind of character is also found in *Pontoporeia,* the former type of another family, which is also a fossorial genus and which we think belongs in Gammaridae. Apparently this feature has something to do with fossorial behavior but is not widespread. We have redefined *Pontogammarus* and *Obesogammarus* so as to transfer out all knobbed urosome species into *Dikerogammarus,* though, unfortunately that action increases the morphologic diversity of *Dikerogammarus* to include species with shortened *Pontogammarus*-like antennae and setose coxae. These extraneous species, *D. turcarum* and *D. spandli,* are also ecologically exotic as they occur in places outside of the Pontocaspian basin but they are adequately distinct from *Dikerogammarus* and *Obesogammarus* and warrant generic segregation (=*Turcogammarus*).

Comments on Pontocaspian Genera

A key to the gammarid genera of the Pontocaspian fauna is presented below so as to put into perspective our comments about the *Dikerogammarus-Pontogammarus* section treated by Stock (1974). The presumed ancestral type of the gammarid group would lie near *Echinogammarus,* a genus with numerous species throughout Europe and western Asia. *Caspicola* is entered under the first number because we are uncertain as to its affinity; it might be a degenerate relative of *Cardiophilus* or have an entirely distinct ancestry from gammarids. Many non-Gammarids occur in the region but these taxa, such as *Corophium,* are omitted. The Black Sea has several marine gammarid genera which also are omitted.

Below are comments on our revision of the genera, followed by the key to genera and the formal revisionary actions.

1. *Cardiophilus* Sars, 1896: Consisting of 2 species (Black Sea, Caspian Sea) living commensally in molluscan mantles, especially in *Cardium* spp.; this genus is well distinguished in the modified mouthparts; the palp of maxilla 1 is short and its 2 articles are of equal length; the maxillipedal dactyl is vestigial.

2. *Iphigenella* Sars, 1896: A single species commensal on decapods is also

well distinguished in its prehensile pereopods 3–7, formed by thickened and spinose propodus.

3. *Lanceogammarus,* new genus: The type-species of this genus, *Gammarus andrussowi* Sars, 1896, formerly was placed in *Iphigenella* or *Lobogammarus* (a Baikalian genus) but we have decided to restrict *Iphigenella* to the one species with prehensile pereopods on the assumption that its inquilinous behavior signals numerous other differences. *Lanceogammarus* differs from *Lobogammarus* in the enlarged gnathopod 1.

4. *Baku,* new genus: *Pontogammarus paradoxus* Derzhavin and Pjatakova (1967) is clearly not a *Pontogammarus* because of enlarged gnathopod 1; it therefore resembles *Iphigenella* and *Lanceogammarus* but gnathopod 2, unlike that of *Iphigenella* and *Lanceogammarus,* has the same shape as gnathopod 1.

5. *Shablogammarus* Carausu, Dobreanu and Manolache, 1955: Stock (1974) considered *Akerogammarus* Derzhavin and Pjatakova (1967) to be a synonym of *Shablogammarus* but we continue to maintain the two genera because *Shablogammarus* has article 2 of pereopod 6 expanded and lobate, unlike *Akerogammarus*. Both genera have the appearance of neoteny or pedogenesis not only because of the general reduction of setae coupled with retention of lobate article 2 on pereopod 7, but in the small body size of the species in either genus.

6. *Pandorites* Sars, 1895a: This genus is very close to *Pontogammarus* but especially to *Obesogammarus platycheir* (Sars, 1896); it differs from both taxa in the reduction of lobation on coxa 4 and the removal of the eyes towards the anterior head margin; otherwise *Pandorites* shares with *O. platycheir* the unusual condition of thin and tapered coxa 1. The shape of gnathopods in *Pandorites* is no longer the unusual feature mentioned by several authors as this is found in *Pontogammarus, Obesogammarus,* and other Caspian genera.

7. *Dikerogammarus* Stebbing, 1899: To clarify this genus and *Obesogammarus* Stock (1974), we validate the usefulness of urosomal knobs as a generic character and remove *Pontogammarus spandli* S. Karaman (1931) and *Obesogammarus turcarum* Stock (1974) from *Obesogammarus* to a new genus, *Turcogammarus*. *Dikerogammarus* thus receives all other species with urosomal knobs and *Obesogammarus* remains free of knobbed species. The species to be relegated to *Turcogammarus* differ from *Obesogammarus* in the presence of urosomal knobs and from *Dikerogammarus* in the strong setosity on the anterior coxae and on article 2 of pereopods 5–7. *Turcogammarus* thus is composed of species evolved as escapees from the Pontocaspian Basin as the two species occur in streams and springs of Greece (*spandli*) or in a fountain (*turcarum*) near Mt. Ararat (which is close to but ecologically remote from Pontocaspian environments).

Cephalogammarus, new genus, is removed from *Dikerogammarus* because of the immense head so foreign to any Pontocaspian genus.

Urosomal knobs are diminished in *D. fluviatilis* Martynov (1919) and that species is close to the ancestral *Chaetogammarus* stock of *Echinogammarus*.

8. *Euxinia* Tucolesco, 1933: Soon after its establishment this genus was made a synonym of *Pontogammarus* Sowinsky (1904) because its type-species, *Euxinia fagei* Tucolesco, proved to be a synonym of *Pontogammarus maeoticus* (Sars, 1896). However, *maeoticus* differs from typical *Pontogammarus, G. robustoides* Sars (1894a), in the variramous uropod 3 (parviramous in *robustoides*). We have decided to recognize this as a generic distinction in the *Dikerogammarus-Pontogammarus* group because it has significance in the *Gammarus-Echinogammarus* group and in *Uroniphargoides* Stock (see below). In the very least it allows nomenclatural recognition (euxiniin uropod 3) for a primitive condition that may have some future bearing in explaining evolutionary deployment of the group.

9. *Stenogammarus* Martynov, 1924: We have had great difficulty accepting this genus because its main distinction, the elongate article 2 on the outer ramus of uropod 3, has diverse states in the several species, is often elongate in the juveniles of species in other genera (as shown in various illustrations of Carausu, 1943), and is almost impossible to define mathematically because article 1 of the outer ramus varies so much in its relative proportions to the peduncle. There is no measurement base. However, once one commences synonymizing of *Stenogammarus* with another genus, difficulties arise as to which genus would be the senior synonym and erosion of character value occurs so extensively that one is required to synonymize many pontogammarid genera. All of these genera differ from each other only by one main character and the appended key we have designed has to be constructed in a certain sequence so as to maintain the genera. Once one character state is abandoned, one cannot justify maintaining any of the other character states.

We clearly are faced with a group in which genera cannot be defined with absolute precision. But the *Stenogammarus* condition is a most useful idea to preserve so as to discuss evolutionary sequences, as shown in the example in the next two paragraphs.

Although general amphipodan apomorphy assumes a streamlining and simplification of morphology, the situation in *Pontogammarus* and *Stenogammarus* is far from clear. Martynov (1924) established *Stenogammarus* on its slender body, small gnathopods, and elongate article 2 on the outer ramus of uropod 3. The first 2 characters are ordinary amphipodan simplifications but the latter is assumed to be a plesiomorphic (primitive) character and this is confirmed to some extent in its recapitulation in juveniles of

certain species of *Pontogammarus* such as the taxon identified as *P. crassus* (see Carausu, 1943: pl. 52 and remarks below under the title *Stenogammarus* sp.). *Stenogammarus* could therefore be considered a neotenic genus in which the juvenile form of body, gnathopods and uropod 3 is carried into adulthood; this could also be said for pereopods 3–4, which in *Stenogammarus* (and *Obesogammarus* and *Akerogammarus*) are much more simplified in adults than in *Pontogammarus*. But this sequence is complicated by the fact that the species of *Euxinia* are more plesiomorphic than those of *Pontogammarus*.

Euxinia is composed of pontogammarids with partially elongate inner ramus of uropod 3, of variramous kind. This condition is also found in *compressus* (assigned by Stock to *Stenogammarus,* see next item).

10. *Gammarus compressus* Sars, 1894a: This species was accepted in *Stenogammarus* by Stock (1974) because of the stenogammarid antenna 2, elongate article 2 on the outer ramus of uropod 3 and the typical *Pontogammarus-Stenogammarus* antenna 1, coxae, and urosome. We do not accept the taxonomic workability of the stenogammarid antenna 2, in which case *Gammarus compressus* becomes a problem because: (1) the slightly elongate inner ramus of uropod 3 puts the species near *Euxinia*; (2) the elongate article 2 on the outer ramus of uropod 3 suggests *compressus* should be retained in *Stenogammarus* and is wholly atypical of *Pontogammarus, Euxinia* and *Obesogammarus*; (3) *compressus* also does not belong with the type-species of *Stenogammarus* because the non-ovate article 2 on pereopod 6, which in, *macrurus,* the type-species of *Stenogammarus,* is ovate, is, in *compressus,* posteriorly excavate as in *Pontogammarus, Euxinia* and *Obesogammarus*. All but *compressus* in *Euxinia* have a multisetose medial margin on the inner ramus of uropod 3, and thus *compressus* is not typical of any genus.

11. *Obesogammarus* Stock, 1974: This genus differs from *Pontogammarus* only in the bundled, not fan-like distribution of posterior setae on article 4 of pereopod 4. It is a difficult character to assess and may not have any monophyletic basis. On pereopod 3 this same article has a variety of setal arrangements. If the species *macrurus* and *similis* are properly placed in *Stenogammarus* because of elongate article 2 on the outer ramus of uropod 3, then, *Stenogammarus,* for example, has both continuous and bundled setae on pereopod 4. This shows again how carefully one must design a key to keep genera segregated.

12. *Compactogammarus* Stock, 1974: This genus, in the *Niphargoides* complex, differs from *Niphargoides* Sars (1894a) only in the absence of D setae on article 3 of the mandibular palp, the more slender peduncles of antennae 1–2, by the shape of the hand on male gnathopod 2 and the broader article 2 of pereopod 5 (not 7!) with ventrally projecting lobe (though weak). The antennal differences of *compactus* are not as strong in material figured

by Carausu (1943) and we consider the gnathopodal difference as worthless. The mandibular palp distinction is precisely the same already ignored in *Pontogammarus* (*aestuarius* and *borceae*) so that *Compactogammarus* differs from *Niphargoides* mainly in the slightly distinct article 2 of pereopod 5.

13. *Uroniphargoides* Stock, 1974: Differing from *Niphargoides* Sars (1894a), mainly in the vari- or magniramous uropod 3 in contrast to the parviramous condition of *Niphargoides*. This makes consistent our *Euxinia* application of the same character as written above.

14. *Paraniphargoides* Stock, 1974: Stock did not distinguish this genus from *Niphargogammarus* Birstein (1945), directly, as his key segregated them into groups with D-setae (*Paraniphargoides*) and without (*Niphargogammarus*). But, otherwise, we can find no differences of any significance and already have mentioned how this character distinction is ignored in *Pontogammarus* (*aestuarius* and *borceae*). Of course, this raises the absurdity that the character perhaps should be valued at generic level in *Pontogammarus* because a presence or absence of epimeral setation is used to separate *Niphargogammarus* and *Paraniphargoides* from *Niphargoides*. In reality only the presence or absence of a fan of setae on epimeron 3 separates *Niphargoides* from the other 2 genera.

We can make little nomenclatural progress in these cases until mouthparts of the type-species of *Niphargogammarus* are examined. They have never been described and apparently Stock relied on conditions in *Niphargogammarus intermedius* (Carausu, 1943) to typify *Niphargogammarus*.

15. *Gmelina* Sars is divided into 3 genera, with *Yogmelina,* new genus, and *Kuzmelina,* new genus, removed to clarify the taxa. *Kuzmelina* is a very advanced product of *Gmelina* in which dorsal cuspidation has doubled but also in which the head has the incipient wing so well developed in *Gmelinopsis* and *Axelboeckia*. On the other hand, *Yogmelina* represents a stage between *Echinogammarus* and *Gmelina,* in which the accessory flagellum has been reduced and coxa 1 curved forward (unlike *Echinogammarus*) but on which dorsal carinae have not yet developed. *Gmelina* departs from the regular evolutionary sequence in the thinner antenna 1 which in *Yogmelina* is becoming somewhat like the *Pontogammarus* form.

In summary, full discontiguity in generic deployment of Caspian pontogammarids is not complete, unless one employs only very sharply defined single characters and then designs diagnoses and keys to partition the species in a downstepped sequence that ignores intergrading or mixed character states in attendant genera.

In defense of this position we note that elongation of the inner ramus of uropod 3 is the main characteristic of *Euxinia* but that *Stenogammarus compressus* also shares this character plus the elongate article 2 on the outer ramus of uropod 3 which is characteristic of *Stenogammarus*. Only by de-

sign of the keys can *compressus* be retained in one or the other genera and additionally the species has *Pontogammarus*-like pereopod 4 rather than the form with bundled setae characteristic of most species of *Stenogammarus*. *Stenogammarus compressus* is retained in *Stenogammarus* because of article 2 on uropod 3 and antenna 2.

A second case of intergeneric transition involves *Euxinia sarsi* which has the long inner ramus of uropod 3 and short article 2 on the outer ramus (as in *Euxinia*) but has the disproportionate antenna 2 very close to the definition of *Stenogammarus*. *Euxinia maeoticus* shares this difficulty.

Key to Gammarid Genera in Pontocaspian Basin

1. Gnathopods chelate ..... *Caspicola* (?not Gammarid)
– Gnathopods subchelate 2
2. Body carinate or knobbed 3
– Body not carinate 11
3. Gnathopods of eusirid form ..... *Gammaracanthus*
– Gnathopods not of eusirid form 4
4. Head with anteroventral tooth exceeding lateral cephalic lobe 5
– Head with vestigial or no anteroventral tooth 6
5. Telson broader than long, outer ramus of uropod 3 lacking article 2 ..... *Axelboeckia*
– Telson as long as broad, outer ramus of uropod 3 biarticulate .... *Gmelinopsis*
6. Article 2 of pereopod 7 with large ventral lobe, accessory flagellum 2+-articulate 7
– Article 2 of pereopod 7 with minute lobe or no lobe, accessory flagellum 1-articulate 10
7. Pereopod 6 much longer than pereopod 7, articles 2–7 of pereopod 7 short ..... *Pontoporeia*
– Pereopod 6 not much longer than pereopod 7, articles 2–7 of pereopod 7 not short 8
8. Uropod 3 strongly extended, telson incised nearly to base, urosomites with knobs ..... *Dikerogammarus*
– Uropod 3 not extended, urosomites without knobs 9
9. Telson cleft nearly to base; urosomites spinose; antenna 1 longer than antenna 2; inner ramus of uropod 3 shorter than one third of first article of outer ramus, outer ramus 2-articulate ..... *Amathillina*
– Telson convex distally, not incised; urosomites smooth; antenna 1 as long as antenna 2 or longer than antenna 1, inner ramus of uropod 3 nearly as long as outer, latter 1-articulate .... *Gammarellus*
10. Body carina single, lateral cephalic lobes quadrate, head lacking anterolateral wing ..... *Gmelina*

– Body carina double-knobbed bilaterally, lateral cephalic lobes protruding and rounded, head with anterolateral wing ..... *Kuzmelina*

11. Palp of maxilla 1 with articles subequal to each other, antenna 2 much smaller than antenna 1 12
– Palp of maxilla 1 with article 2 elongate (or palp 1-articulate), antenna 2 not much smaller than antenna 1 14
12. Article 2 of pereopods 5–7 lobate ventrally ..... *Behningiella*
– Article 2 of pereopods 5–7 not lobate 13
13. Coxa 4 weakly lobed, uropod 3 parviramous, telson short, gnathopods dissimilar, wrist of gnathopod 2 elongate ..... *Cardiophilus* (in part)
– Coxa 4 unlobed, uropod 3 uniramous, telson of ordinary length, gnathopods alike, wrists of gnathopods 1–2 short ..... *Pachyschesis* (Baikal)
14. Article 2 of pereopod 7 without ventral lobe 15
– Article 2 of pereopod 7 expanded and ventrally lobate 18
15. Accessory flagellum 1-articulate ..... *Yogmelina*
– Accessory flagellum 2+articulate 16
16. Article 3 of antenna 2 with ventral keel ..... *Derzhavinella*
– Article 3 of antenna 2 without ventral keel 17
17. Article 3 of antenna 1 longer than article 1 ..... *Sowinskya*
– Article 3 of antenna 1 shorter than article 1 ..... *Echinogammarus*
18. Primary flagellum of antenna 1 shorter than peduncle (usually shorter than article 1) and also accessory flagellum more than 40 percent as long as primary flagellum (=*Niphargoides* kind of antenna 1) .. 19
– Primary flagellum of antenna 1 longer than peduncle and also accessory flagellum less than 40 percent as long as primary flagellum (=*Dikerogammarus* form of antenna 1) 23
19. Epimeron 3 with posteroventral setal fan on face 20
– Epimeron 3 without setal fan 22
20. Inner ramus of uropod 3 more than half as long as outer ramus .. *Uroniphargoides*
– Inner ramus of uropod 3 about one third as long as outer ramus .. 21
21. Mandibular palp with D-setae, article 2 of pereopod 5 unlobed ..... *Niphargoides*
– Mandibular palp without D-setae, article 2 of pereopod 5 with posteroventral lobe ..... *Compactogammarus*
22. Mandibular palp lacking D-setae, article 2 on outer ramus of uropod 3 elongate, articles 4–5 of antenna 2 each about as long as article 3 (scarcely longer) ..... *Niphargogammarus*
– Mandibular palp with D-setae, article 2 on outer ramus of uropod 3 not elongate, articles 4–5 of antenna 2 significantly longer than article 3 ..... *Paraniphargoides* (doubtful)

23. Gnathopod 1 stouter than gnathopod 2 24
– Gnathopod 1 not stouter than gnathopod 2 27
24. Pereopods 3–7 prehensile ..... *Iphigenella*
– Pereopods 3–7 not prehensile 25
25. Accessory flagellum 1-articulate (*brachyura* atypical of *Yogmelina*) ..... *Yogmelina* (twice)
– Accessory flagellum 2+-articulate 26
26. Gnathopods strongly dissimilar, gnathopod 2 very thin; antennae elongate; posterodistal corner of epimeron 3 acute but tooth short ..... *Lanceogammarus*
– Gnathopods alike, gnathopod 2 scarcely smaller than gnathopod 1; antennae short; posterodistal corner of epimeron 3 with strong tooth ..... *Baku*
27. Coxa 4 with poorly developed posterior lobe; eyes situated at anterior margin of head 28
– Coxa 4 with well developed posterior lobe; eyes in middle of cephalic lobe 29
28. Gnathopods large, gnathopod 2 enlarged; article 2 of pereopod 7 widely expanded and lobate ..... *Pandorites*
– Gnathopods feeble, gnathopod 2 small but elongate, article 2 of pereopod 7 narrow and weakly lobate ..... *Cardiophilus* (in part)
29. Article 2 of pereopod 6 with strong posterodistal lobe 30
– Article 2 of pereopod 7 without posterodistal lobe 32
30. Article 4 of pereopods 5–7 dilated ..... *Zernovia*
– Article 4 of pereopods 5–7 not dilated 31
31. Article 2 on outer ramus of uropod 3 short, not setose on sides, coxae 1–4 with short or no setae, antenna 1 of *Gammarus* form ..... *Shablogammarus*
– Article 2 on outer ramus of uropod 3 elongate, with setae on sides, coxae 1–4 with long setae, antenna 1 of *Pontogammarus* form ... . *Stenogammarus macrurus* of Carausu, 1943
32. Urosome with large knob(s) 33
– Urosome without knobs 35
33. Head giant ..... *Cephalogammarus*
– Head ordinary 34
34. Coxae 1–4 and article 2 of pereopods 5–7 strongly setose on margins ..... *Turcogammarus*
– Coxae 1–4 and article 2 of pereopods 5–7 with short and sparse setae ..... *Dikerogammarus*
35. Article 4 of pereopod 4 with only 4–5 posterior setae, (antenna 1 of *Dikerogammarus* form) ..... *Akerogammarus*
– Article 4 of pereopod 4 with 10+ posterior setae, (antenna 1 of *Pontogammarus* form) 36

36. Article 2 on outer ramus of uropod 3 "elongate" (15+ percent of article 1), first 2 flagellar articles of antenna 2 together more than 95 percent as long as article 5 of peduncle ..... *Stenogammarus*
– Article 2 on outer ramus of uropod 3 not elongate (less than 12 percent of article 1), first 2 flagellar articles of antenna 2 together less than 80 percent as long as article 5 of peduncle 37
37. Posterior setae on article 4 of pereopod 4 divided into groups .... *Obesogammarus*
– Posterior setae on article 4 of pereopod 4 in continous fan 38
38. Inner ramus of uropod 3 about half as long as outer ramus .... *Euxinia*
– Inner ramus of uropod 3 about one third as long as outer ramus .. .. *Pontogammarus*

Baku, Karaman and Barnard, new genus

Type-species.—Pontogammarus paradoxus Derzhavin, in Derzhavin and Pjatakova (1967). Named for the city on the Caspian Sea. Masculine.

Body somewhat slender, urosomites free, at least segment 3 with 2 dorsal spines, others apparently flat and naked. Rostrum obsolescent, lateral cephalic lobes subquadrate, sinus present. Eyes very small.

Antennae short, extending subequally; antenna 1 of *Pontogammarus* form (almost of *Niphargoides* form), no articles humped, ratio of peduncular articles = 26:10:6, ratio of flagella = 24:10, ventral setae of article 1 on peduncle weak and terminal, accessory flagellum 3-articulate. Ratio of articles 3,4,5 and flagellum of antenna 2 = 8:11:13:26 (to some extent of *Stenogammarus* form), article 3 weakly humped.

Mouthparts [unknown].

Coxae of medium size, setose, coxa 1 weakly curved anteriorly, coxa 4 lobed. Gnathopods 1–2 strongly subchelate, of medium size, gnathopod 1 enlarged but otherwise almost like gnathopod 2, wrists short (but shorter on gnathopod 1), scarcely lobed, hands weakly elongate, subrectangular, palmar slopes almost identical, oblique, short.

Pereopods 3–7 moderately fossorial; article 4 of pereopod 4 narrow but with 10+ posterior groups of (very few) setae (each), article 5 weakly expanded, moderately setose posteriorly. Article 2 of pereopods 5–7 densely setose posteriorly, of pereopod 5 weakly expanded and scarcely lobate, of pereopod 6 unexpanded, tapering, unlobate, posteriorly excavate; of pereopod 7 expanded, lobate.

Pleopods ordinary. Epimeron 3 lacking posteroventral fan of setae, posteroventral corner with sharp, weakly curved tooth. Rami of uropods 1–2 extending equally, [peduncular and ramal spination or setation unknown]. Uropod 3 not extended beyond uropods 1–2, parviramous, outer ramus

short, weakly spinose and setose, article 2 short. Telson of ordinary length, lobes tapering, moderately setospinose apically.

Gills [?2–6], broadly ovate, stalked. Oostegites of medium expansion.

Relationship.—Differing from ordinary pontogammarid genera in enlarged gnathopod 1; from *Iphigenella* Sars in lack of prehensility on pereopods 3–7; from *Lanceogammarus* new genus in the enlarged female gnathopod 2, which, though not as large as gnathopod 1, is significantly enlarged; from *Pachyschesis* Bazikalova, in curved coxa 1, lobed coxa 4, presence of long fully ventral setae on coxae 1–4, the distinctly lobate pereopod 7 and distinctly though weakly enlarged gnathopod 1; from *Amathillina* Sars in the uncarinate body and more strongly setose coxae and pereopods; differing from *Yogmelina brachyura* by the 3-articulate accessory flagellum, by the sharp tooth on epimeron 3 and by the distinctly lobate basis of pereopod 7. *Lobogammarus* has gnathopod 1 smaller than gnathopod 2.

Species.—paradoxus (Derzhavin, in Derzhavin and Pjatakova, 1967); Caspian Sea, moderately fossorial, 1.

Cephalogammarus Karaman and Barnard, new genus

Type-species.—Gammarus macrocephalus Sars, 1896.

Name.—Reference to encephalized *Gammarus*. Masculine.

Body ordinary, urosomites free, 1–2 each with large elevated knob, all weakly spinose. *Head greatly enlarged,* about as long as first 2.5 pereonites, rostrum small, lateral cephalic lobes subquadrate, sinus present. Eyes present.

Antennae elongate, antenna 1 slightly the longer, of *Dikerogammarus* form, no articles humped, ratio of peduncular articles = 30:21:12, ratio of flagella = 114:21, ventral setae of peduncular article 1 weak and terminal; accessory flagellum with 3–6 articles. Ratio of articles 3,4,5 and flagellum of antenna 2 = 12:22:20:34, article 3 unhumped.

Mouthparts unknown, though unexpanded view of mandibular palp showing D and E setae, presumed to be as in *Dikerogammarus*.

Coxae elongate, long setae absent, coxa 4 lobate. Gnathopods 1–2 strongly subchelate, large to medium, gnathopod 2 enlarged but like gnathopod 1, wrists short, weakly to poorly lobed respectively, hands elongate, palmar slopes almost identical, oblique, of medium length; female [unknown].

Pereopods 3–7 moderately fossorial; article 4 of pereopod 4 narrow, with 4–5 widely separated groups of sparse posterior setae, article 5 narrow, rectangular, with only 3–4 posterior setal groups. Article 2 of pereopods 5–7 with short posterior setules, of pereopods 5–6 weakly expanded, unlobate, posterior margins both weakly concave (sinuous), of pereopod 7 expanded, lobate.

Pleopods ordinary. Epimeron 3 lacking posteroventral fan of setae. Outer ramus of uropod 2 slightly shortened and lacking marginal spines, peduncle of uropods 1–2 apparently without setae. Uropod 3 extended, parviramous, outer ramus elongate, setose, weakly spinose, article 2 short. Telson of ordinary length (slightly short), almost fully cleft, apices of medium width, moderately setospinose.

Gills [?2–6]. Oostegites [?slender].

Relationship.—Like *Dikerogammarus* but head immense.

Species.—*macrocephalus* (Sars, 1896); Caspian Sea, moderately fossorial, 1.

Kuzmelina, Karaman and Barnard, new genus

Name.—Contrived. Feminine.

Type-species.—*Gmelina kusnezowi* Sowinsky, 1894.

Body carinate, with bilateral dorsal lines of humps anterior to urosome, best developed on pereonite 6 to pleonite 3; pereonal pleurae humped. Urosomites free, poorly armed. Rostrum short, lateral cephalic lobes protuberant, mammilliform, sinus obsolescent but rudimentary lateral wing tooth present (reminiscent of *Axelboeckia*). Eyes present, very close to anterior cephalic margin.

Antennae of medium size and extension, almost of equal extent, antenna 1 slender, of *Dikerogammarus* form, ratio of peduncular articles = 30:24:15, flagellar ratio = 66:4, ventral setae of peduncular article 1 weak and mostly terminal, *accessory flagellum 1-articulate*. Ratio of articles 3,4,5 and flagellum of antenna 2 = 15:33:32:42, no articles humped.

Mouthparts unknown, space below for addition when described. Labrum [?broader than long, entire, rounded]. Mandibular incisor [?toothed, molar triturative, ratio of palp articles = 00:00:00, article 3 weakly falcate, setae = ABCDE]. Inner lobes of labium [?absent, weakly gaping]. Maxillae [?well setose medially, inner plate of maxilla 1 triangular, fully setose medially, outer plate with ?7 spines, palps asymmetric]. Inner plate of maxilla 2 [?with oblique facial row of setae]. Outer plate of maxilliped [?medially spinose, article 3 of palp unlobed, dactyl shorter than 3, unguiform, with nail].

Coxae long, setae short to medium, coxa 1 slightly curved forward, coxa 4 lobed, coxa 5 shorter than 4. Gnathopods medium to small, subchelate, male gnathopods of medium size, alike, wrists short-medium, scarcely lobed, hands elongate, palms oblique, excavate, well defined, of medium length; female gnathopods small, dissimilar, hands similar, rectangular, palms oblique, short, wrists poorly lobed, wrist of gnathopod 1 short, of gnathopod 2 elongate or medium.

Pereopods 3–7 not fossorial. Article 2 of pereopods 5–6 scarcely expanded and tapering, unlobate, of pereopod 7 weakly expanded, unlobate, of 5–7 weakly setose posteriorly.

Pleopods ordinary. Epimeron 3 lacking posteroventral fan of setae. Rami of uropods 1–2 extending equally, lacking marginal spines, peduncles poorly armed. Uropod 3 weakly extended, parviramous, outer ramus elongate, weakly spinose and setose, article 2 short. Telson short, broad, deeply cleft, apices strongly spinose, with lateral spines.

Coxal gills [?2–6]. Oostegites [?slender].

Relationship.—Differing from *Gmelina* Sars in the doubled carina, the protruding cephalic lobes, the rudimentary cephalic wing, the marginal eyes and short telson. See *Gmelinopsis*.

Species.—kusnezowi (Sowinsky, 1894) (Sars, 1894); Caspian and Azov seas, 1.

Lanceogammarus Karaman and Barnard, new genus

Type-species.—Gammarus andrussowi Sars, 1896 (here selected).

Name.—Lanceo—referring to thin gnathopod 2 of a *Gammarus*-like taxon. Masculine.

Body ordinary, urosomites free, unhumped, spinose. Rostrum obsolescent, lateral cephalic lobes subquadrate, sinus present. Eyes present.

Antennae elongate, antenna 1 much longer than antenna 2, of *Dikerogammarus* form, no articles humped, ratio of peduncular articles = 30:22:10, ratio of flagella = 150:18, ventral setae of peduncular article 1 weak and terminal, accessory flagellum multiarticulate. Ratio of articles 3,4,5 and flagellum of antenna 2 = 15:36:36:57, article 3 weakly humped.

Labrum [?broader than long, entire, rounded]. Mandibular [?incisor toothed, molar triturative], ratio of palp articles = 4:13:10, article 3 weakly falcate, setae = BDE. Inner plate of maxilla 1 triangular, fully setose medially, outer plate with 10 (?11) serrate spines, palps [?asymmetric]. [?Inner plate of maxilla 2 with oblique facial row of setae]. Outer plate of maxilliped medially setose, article 3 of palp unlobed, dactyl shorter than 3, unguiform, [?with nail or not, illustration in Carausu, 1943, not showing nail].

Coxae of medium size, long setae absent, coxa 4 lobed. Gnathopods 1–2 strongly subchelate, diverse, medium to small, gnathopod 1 enlarged, with short scarcely lobed wrist, hand elongate, palm oblique, of medium length; gnathopod 2 small, thin, wrist elongate, scarcely lobed, hand almost as long as wrist, rectangular, palm oblique, very short; male gnathopod 1 larger than in female.

Pereopods 3–7 weakly fossorial; article 4 of pereopod 4 narrow, with 2 widely separated groups of setae and spines, article 5 narrow, rectangular, with only 2 posterior setae-spine groups. Article 2 of pereopods 5–7 moderately expanded and moderately setose posteriorly, pereopods 5–6 scarcely to weakly lobate, pereopod 7 strongly lobate, article 2 of pereopod 6 convex posteriorly.

Pleopods ordinary. Epimeron 3 lacking posteroventral fan of setae. Outer ramus of uropod 2 slightly shortened, lacking marginal spines, peduncle of uropod 1 with basofacial spine, no setae. Uropod 3 extended, parviramous, outer ramus elongate, weakly spinose, article 2 of medium length. Telson short, deeply cleft, apices tapering to medium width, spinose, also with basodorsal spine pairs.

Gills [?2–6]. Oostegites slender.

Relationship.—Differing from *Akerogammarus, Dikerogammarus, Lobogammarus, Shablogammarus,* and *"Stenogammarus" macrurus* of Carausu (1943) in the enlarged gnathopod 1. See *Baku*; *Iphigenella andrussowi* formerly assigned to *Iphigenella* but differing from that genus in the nonprehensile pereopods.

Species.—*andrussowi* (Sars, 1896); Caspian and Black seas and their tributaries, 1.

Stenogammarus Martynov

Stenogammarus Martynov, 1924:41; Stock, 1974:85 (*Gammarus macrurus* Sars, 1894a, selected by Stock, 1974).
Wolgagammarus Stock 1974:85 (valid subgenus, see below).

Body slender, urosomites free, unhumped, scarcely setulate or weakly spinose. Rostrum small, lateral cephalic lobe rounded or subquadrate, sinus present. Eyes present.

Antennae short to medium, extending subequally; antenna 1 of *Pontogammarus* form, no articles humped, ratio of peduncular articles = 35:13:8, flagellar formula = 58:15, ventral setae of peduncular article 1 weak and terminal, accessory flagellum multiarticulate. Ratio of articles 3,4,5 and flagellum of antenna 2 = 18:21:19:50, article 3 weakly humped, [antenna 2 of *Stenogammarus* form in which first 2 articles of flagellum together are almost as long as peduncular article 5, and articles 4–5 of peduncle not humped, slender, article 5 the thinner, hence article 5 forming blend between article 4 and flagellum; this concept so variable and difficult to treat we abandon it as taxonomic device].

Mouthparts of type-species unknown but probably as follows: [Labrum broader than long, entire, rounded truncate. Mandibular incisor toothed, molar triturative, ratio of palp articles = 5:15:12, article 3 curved-linear, setae = AB(D)E, D and E setae terminal. Labium without inner lobes. Maxillae medially setose, inner plate triangular, fully setose medially, outer plate with 11 spines, palps ?asymmetric. Inner plate of maxilla 2 with oblique facial row of setae. Outer plate of maxilliped medially spinose, article 3 of palp unlobed, dactyl shorter than 3, unquiform, ?with nail].

Coxae of medium size to long, setae short and sparse, coxa 4 lobed.

Gnathopods strongly subchelate, medium to small, gnathopod 2 of male slightly larger than but like gnathopod 1, wrists short, poorly lobate, hands elongate to stout, palmar slopes identical, oblique, of medium length; female gnathopods both much smaller than in male, almost identical in size, wrists much longer but wrist of gnathopod 2 much longer than in gnathopod 1, hands subrectangular, palms short.

Pereopods 3–7 moderately fossorial; article 4 of pereopod 4 with posterior setae arranged in bundles (type) or continuously (*similis*), article 5 narrow and rectangular (type) or expanded and trapezoidal (*similis*). Article 2 of pereopods 5–7 weakly (type) to strongly (*similis*) setose, in type article 2 of pereopod 5 not posteriorly setose, of pereopods 6–7 with short sparse setae, of pereopod 6 weakly expanded, posterior margin convex, of pereopods 5 and 7 strongly expanded, lobate.

Pleopods ordinary. Epimeron 3 lacking posteroventral fan of setae. Rami of uropods 1–2 extending evenly, [?apparently outer ramus of uropod 2 lacking marginal spines, basofacial setae of uropod 1 apparently present]. Uropod 3 strongly extended, parviramous, peduncle slightly elongate (or not), outer ramus elongate, (spinose) and setose, article 2 elongate. Telson of ordinary length, apices of medium width, moderately spinose.

Gills [?2–6]. Oostegites of medium breadth.

Relationship.—Differing from *Pontogammarus* Sowinsky, *Euxinia* Tucolesco and *Obesogammarus* Stock in the elongate article 2 on the outer ramus of uropod 3.

Notes.—Antennal measurements taken from *carausui* (=*similis* of Carausu, 1943); *S. macrurus* of Carausu (1943) removed to incertae sedis below.

Variants.—Species other than the type with concave or sinuous posterior margin on article 2 of pereopod 6.

Species.—*carausui* Derzhavin and Pjatakova, 1962 (=*similis* of Carausu, 1943, =*olearii* Derzhavin, 1951, =*compresso-similis* Carausu et *et alia* 1955 [nomen nudum], =*karauschi* Dedui, 1967, =*kereuschui* Mordukhai-Boltovskoi and Ljakhov, 1972), *compressus* (Sars, 1894a), *deminutus* (Stebbing, 1906) (=*minutus* Sars, 1894a), *macrurus* (Sars, 1894a), *similis* (Sars, 1894a); Caspian, Azov and Black seas, attendant rivers, fossorial, 5 (see *Stenogammarus* sp. below).

Stenogammarus sp.

Stenogammarus macrurus.—Carausu, 1943:59, plates 16, 17 (not Sars, 1894a).

Like *Stenogammarus* but article 2 of pereopod 6 lobate; like *Shablogammarus* Carausu, Dobreanu and Manolache, but article 2 on outer ramus of uropod 3 elongate, coxae 1–4 with long setae, antenna 1 of *Pontogammarus* form.

Carausu's material needs reexamination to see if it is properly described and, indeed, whether or not Sars's depiction of *S. macrurus* is correct. If not, all species of *Stenogammarus* must be realigned to reflect the outcome. We do not know if Stock (1974) based some of the diagnosis of *Stenogammarus* on this depiction by Carausu, a potential problem needing clarification.

Species.—sp. (*macrurus* of Carausu, 1943); Danube River, fossorial, 1.

Stenogammarus (Wolgagammarus) Stock

S. (*Wolgagammarus*) Stock, 1974:85 (*Stenogammarus dzjubani* Mordukhai-Boltovskoi and Ljakhov, 1972, original designation).

Like *Stenogammarus* but male gnathopod 2 of neotenic form, thus like female; article 5 of pereopods 3–4 especially elongate. Outer margin of uropod 3 with pinnate setae.

Species.—*dzjubani* Mordukhai-Boltovskoi and Ljakhov, 1972; Volga River, man-made lakes, 1.

Turcogammarus Karaman and Barnard, new genus

Type-species.—*Obesogammarus turcarum* Stock, 1974.

Name.—Type-species Turkish. Masculine.

Body ordinary, or carinate, urosomites free, at least 1 and 2 with large elevated process (knob or tubercle), all spinose. Rostrum short, lateral cephalic lobes subquadrate, sinus present. Eyes present.

Antennae of medium length, extending subequally, antenna 1 of *Pontogammarus* form, no articles humped, ratio of peduncular articles = 30:15:7, flagellar formula = 63:17, ventral setae of peduncular article 1 weak and terminal, accessory flagellum 4-articulate. Ratio of articles 3,4,5 and flagellum of antenna 2 = 17:27:21:50, article 3 weakly humped.

Mouthparts of type-species only partly known, bracketed remarks need confirmation: labrum [?broader than long, entire, rounded]. Mandibular incisor [?toothed, molar triturative], ratio of palp articles = 5:12:9, article 3 weakly falcate, setae = ABCDE! Labium with inner lobes [?weak]. Maxillae [?medially setose, inner plate of maxilla 1 triangular, fully setose medially], outer plate with 9 spines, palps asymmetric. Inner plate of maxilla 2 with [?oblique facial row of setae]. Outer plate of maxilliped [?medially spinose, article 3 of palp unlobed, dactyl as long as 3, unguiform, with nail].

Coxae of ordinary length, strongly setose ventrally, coxa 1 weakly dilated distally, coxa 4 lobed. Gnathopods 1–2 subchelate, almost alike in shape, wrists short, scarcely lobed, hands ovate, palms oblique, of medium length, almost identical in slope, each with midpalmar spine, gnathopod 2 larger than 1. Female gnathopods smaller than in male.

Pereopods 3–7 strongly fossorial; article 4 of pereopod 4 weakly expanded, with about 9 posterior bundles of setae, article 5 scarcely expanded, almost linear, strongly setose. Article 2 of pereopods 5–7 strongly setose posteriorly, moderately setose mediofacially, of pereopods 5 and 7 expanded, weakly and strongly lobed posteroventrally respectively, of pereopod 6 tapering and unlobed.

Pleopods ordinary. Epimeron 3 lacking posteroventral fan of setae. Outer ramus of uropod 2 shortened, outer rami of uropods 1–2 without marginal spines. Uropod 3 [?weakly extended], almost parviramous, inner ramus short and scale-like but with several medial setae (by definition thus variramous), outer ramus elongate, weakly spinose and strongly setose, article 2 short. Telson of ordinary length, cleft to base, apices tapering, with several spines and setae.

Coxal gills [?2–6], [?ovoid in type-species, ovoid in *spandli*]. Oostegites narrow.

Variants.—Metasome with dorsomedial keel (*spandli*); gnathopodal palm slopes dissimilar (*spandli*).

Relationship.—Differing from *Dikerogammarus* in the strong setosity of coxae, articles 4–5 of pereopods 3–4 and article 2 of pereopods 5–7; differing from *Obesogammarus* in presence of urosomal knobs.

Species.—*spandli* (S. Karaman, 1931), *turcarum* (Stock, 1974); Northern Greece, springs and streams; Turkey, Mt. Ararat region, fountain (we place in Caucasus province), fossorial but ecology anomalous, 2.

Yogmelina Karaman and Barnard, new genus

Type-species.—*Gmelina pusilla* Sars, 1896.

Name.—Contrived. Feminine.

Body smooth, urosomites free, smooth or spinose. Rostrum short, lateral cephalic lobes protuberant, subacute to rounded, sinus obsolescent. Eyes present.

Antennae of medium size and extending subequally; antenna 1 of *Dikerogammarus* form, no articles humped, but peduncle stout, ratio of peduncular articles = 27:24:15, flagellar formula = 75:5, ventral setae of peduncular article 1 weak and terminal, *accessory flagellum 1-articulate*. Ratio of articles 3,4,5 and flagellum of antenna 2 = 12:21:18:21, no articles humped.

Mouthparts unknown, space below for addition when described. Labrum [?broader than long, entire, rounded]. Mandibular incisor [?toothed, molar triturative, ratio of palp articles = 00:00:00, article 3 weakly falcate, setae = ABCDE]. Inner lobes of labium [?absent, weakly gaping]. Maxillae [?well setose medially, inner plate of maxilla 1 triangular, fully setose medially, outer plate with 7 spines, palps asymmetric]. Inner plate of maxilla 2 [?with oblique facial row of setae]. Outer plate of maxilliped [?medially spinose, article 3 of palp unlobed, dactyl shorter than 3, unguiform, with nail].

Coxae long, setae of medium size, coxa 1 curved forward, coxa 4 poorly (or strongly) lobed, coxa 5 shorter than 4. Gnathopods almost feeble, subchelate, almost of equal width, wrists of medium length, poorly lobed, hands subrectangular, palm oblique on gnathopod 1, transverse on gnathopod 2, short.

Pereopods 3–7 not fossorial. Article 2 of pereopods 5–6 scarcely expanded, tapering, moderately setose posteriorly or not, of pereopod 7 weakly expanded, unlobate or microlobate, moderately or strongly setose posteriorly.

Pleopods ordinary. Epimeron 3 lacking posteroventral fan of setae. Rami of uropods 1–2 extending subequally, peduncular setae absent, basofacial armaments [unknown], outer ramus of uropod 2 [possibly naked marginally]. Uropod 3 scarcely extended, parviramous, outer ramus elongate, weakly setose and spinose, article 2 short. Telson of ordinary length, deeply cleft, lobes tapering, narrowed, weakly setospinose apically and with lateral setae.

Gills [?2–6]. Oostegites [unknown].

Variants.—Inner ramus of uropod 3 slightly elongate (*laeviuscula*); oostegites narrow (*brachyura*); coxal gills 2–6, and ovate, some pediculate, (*brachyura*); coxa 4 slightly smaller than coxa 3 (in type-species, other species with normal coxa 4); gnathopod 1 distinctly larger than gnathopod 2 (*brachyura*); basis of pereopod 7 extremely expanded, almost lobate (*brachyura*); telson cleft only halfway (*brachyura*); cephalic sinus stronger (*laeviuscula*).

Relationship.—Differing from *Echinogammarus* Stebbing in the curved coxa 1 and small, 1-articulate accessory flagellum. *Yogmelina ovata* is especially close to *Echinogammarus warpachowskyi* (Sars) because of the special shape on the basis of pereopod 7. But *Y. ovata* was said by Martynov to have a 1-articulate accessory flagellum (*warpachowskyi* is said to have a 2-articulate accessory flagellum).

Yogmelina brachyura is close to *Baku paradoxus* but differs in the 1-articulate accessory flagellum. See that genus for further diagnosis. Differing from *Lanceogammarus andrussowi* in the 1-articulate accessory flagellum, the more equal gnathopods and the lack of strongly lobate bases on pereopods 5–6. See *Gmelina*.

Species.—*brachyura* (Derzhavin and Pjatakova, 1962), *limana* Karaman and Barnard, new species (=*pusilla* of Carausu, 1943); *laeviuscula* (Sars, 1896), *ovata* (Martynov, 1924), *pusilla* (Sars, 1896); Caspian and Black seas and their tributaries, 5.

Yogmelina limana Karaman and Barnard, new species

Gmelina pusilla.—Carausu, 1943:183–186, pls. 66, 67.—Carausu, Dobreanu, and Manolache, 1955:76, figs. 41–43 (not Sars, 1896).

Name.—Referring to limans (estuaries) of Ponto Caspian deltas.

Description of female. Body smooth, urosomites free, urosomites 1–2 with 2 setae and urosomite 3 with one seta on each dorsolateral surface. Rostrum short, lateral cephalic lobes protuberant, apically obtuse, anteroventral sinus present. Eyes ovoid, as long as diameter of article 1 on antenna 1.

Antenna 1 slightly shorter than antenna 2, ratio of peduncular articles = 28:20:14, relatively slender; accessory flagellum short, 1-articulate, main flagellum with 8 articles. Antenna 2 ordinary; gland cone short, straight; article 3 short, article 4 as long as 5, flagellum 4-articulate, articles elongate.

[Unknown = labrum, labium, maxilla 1, maxilla 2, maxilliped, all of mandible except palp; pleopods, epimeron 1; oostegites, gills; males].

Article 1 of mandibular palp short, article 3 shorter than article 2, subfalciform, setae = ADE.

Coxae of moderate length, 1–4 with long ventral setae; coxa 1 produced or curved forward, with concave anterior margin; coxa 4 scarcely lobed. Gnathopods small, subchelate, wrist gnathopod 1 shorter than hand, poorly lobed; gnathopod 2 scarcely larger than 1, wrist as long as hand, unlobed; hands of gnathopods 1–2 not alike, rectangular, palm well defined, oblique on gnathopod 1, transverse on gnathopod 2.

Pereopods 3–4 ordinary, posterior margin of pereopod 3 with sparse setae in bundles, article 5 very short. Pereopods 5–7; short basis of pereopods 5–6 with parallel sides, with posterodistal lobe; basis of pereopod 7 expanded, with convex posterior margin, beveled distally, lobe absent; basis of pereopods 6–7 setose mediofacially and of pereopods 5–7 on posterior margin.

Epimera 2–3 angular, with long ventromarginal setae. Uropods 1 [?2] ordinary, rami extended subequally, spinose marginally, uropod 1 with groups of basofacial setae. Uropod 3 poorly extended, relatively short, parviramous, outer ramus longer than peduncle, article 2 short. Telson narrow, longer than wide, cleft three fourths, each lobe with 2 distal and 2 dorsofacial setae.

Holotype.—Female (size unknown) figured by Carausu, 1943:183–186, plates 66, 67.

Type-locality.—Lake Katlapug, on delta of Danube River, Black Sea.

Relationship.—This species was identified as the Caspian species, *Gmelina pusilla* by Carausu but differs from that species in the lobed bases of pereopods 5–6, the unlobed basis of pereopod 7, the strongly setose epimera 2–3, and the presence of dorsal urosomal setae.

Yogmelina limana differs from *Y. ovata* Martynov (1924, tributary of River Don) in the narrower and more poorly armed telson. The telson of *Yogmelina ovata* is very broad, tumid and heavily setose. The head, antennae, eyes, uropod 3 and pereopod 7 in part, correspond to those of *Y.*

limana but otherwise *Y. ovata* is very poorly known and *Y. limana,* itself, is poorly known for many characters mentioned in the description above.

Distribution.—Delta of Danube River.

Other Gammaridae

Sandro, Karaman and Barnard, new genus

Type-species.—*Austroniphargus starmuhlneri* Ruffo, 1960 (here selected).

Name.—Named for the great Italian zoologist, Sandro Ruffo. Masculine.

Body ordinary, smooth, urosomites coalesced. Rostrum and lateral cephalic lobes [unknown]. Eyes absent.

Antennae elongate, antenna 1 longer than antenna 2, ratio of peduncular articles = [unknown], accessory flagellum 1-articulate. Antenna 2 ordinary but article 1 grossly swollen.

Labrum broader than long, entire, rounded. Mandibular incisor toothed, molar triturative, ratio of palp articles = 8:10:13, article 3 linear, setae = DE, but setae sparse and mostly near apex. Inner lobes of labium small, fleshy, well marked. Maxillae without medial setation (with medial hairs only), inner plate of maxilla 1 elongate-triangular, with 2 apical setae, outer plate with about 7 toothed spines (5 showing in illustration), palps asymmetric (left narrow and setose, right stout and spinose). Plates of maxilla 2 narrow, lacking medial and facial setae. Both plates of maxilliped of medium size, outer plate medially spinose, palp article 3 unlobate, dactyl as long as 3, unguiform, with nail.

Coxae elongate, coxa 1 not dilated, coxa 4 lobate. Gnathopods of medium size, alike, wrist short, strongly lobed, hand trapezoidal, expanding apicad, palm weakly oblique, palm exceeding defining spines.

Pereopods 3–4 ordinary. Pereopods 5–7 alike, of medium length, article 2 weakly expanded, weakly lobate, weakly setose posteriorly, posterior margins convex or weakly sinuous.

Pleopods ordinary. Rami of uropods 1–2 extending subequally, marginally spinose, basofacial armaments [unknown]. Uropod 3 [?of medium extension], parviramous, peduncle with large apicolateral lobe, outer ramus elongate, moderately setose, article 2 short. Telson elongate, narrow, cleft three fourths, dorsally and distally spinose strongly.

Coxal gills [?2–6], broadly ovate, pedicles [unknown]. Oostegites [unknown].

Relationship.—Allied to *Austroniphargus* Monod (1925:48) but differing in the presence of inner lobes on the labium, the shorter accessory flagellum, the longer coxae, the lobed coxa 4, the large lobe on the peduncle of uropod 3 and the normally developed pleopods.

Species.—*starmuhlneri* (Ruffo, 1960); Madagascar, forest torrent but probably hypogean emergent, 1.

Anopogammarus Derzhavin, revised

Anopogammarus Derzhavin, 1945x: ?not seen.—Birstein and Levuschkin, 1970:1478 (*Anopogammarus birsteini* Derzhavin, 1945x, ?monotypy).

Body ordinary, smooth (type) or with 4 groups of strong spines on dorsal surface of metasomites (*revazi*); urosomites free. Rostrum short, lateral cephalic lobes acute, sinus present. Eyes absent.

Antennae elongate, antenna 1 longer than 2, peduncular articles progressively shorter, primary flagellum elongate, accessory flagellum 4-articulate. Antenna 2 ordinary.

Labrum broader than long, entire, rounded-truncate. Mandibular incisor toothed, molar triturative, ratio of palp articles = 6:19:15, article 3 weakly falcate, setae = BDE. Maxillae fully setose medially, inner plate of maxilla 1 triangular, fully setose medially, outer plate with 11 spines, palps asymmetrically armed, stout, slightly expanded distally, article 1 short. Inner plate of maxilla 2 with oblique facial row of setae. Outer plate of maxilliped medially spinose, article 3 of palp unlobed, dactyl shorter than 3, unguiform, with nail.

Coxae of moderate length, ventral margins lacking long setae; coxa 1 quadrate, coxa 4 lobate. Gnathopods large, almost identical but gnathopod 1 scarcely smaller than gnathopod 2, wrists short, lobed, hand *Gammarus*-like, elongate, palms almost identical, very oblique, long, with one spine near middle.

Pereopods 3–4 ordinary. Pereopods 5–7 of medium length, almost of equal proportions, article 2 alike, scarcely expanded, tapering distally, posterior margin weakly sinuous, or weakly convex, with short setae, posteroventral corner weakly lobate (protuberant).

Pleopods ordinary. Rami of uropods 1–2 extending equally, each ramus with marginal spine (possibly one absent in *revasi*), uropod 1 peduncle with basofacial spine [unknown in *revazi*]. Uropod 3 not extended, variramous, inner ramus reaching about halfway along article 1 of outer ramus, with few marginal setae or spines, outer ramus 2-articulate (type) or 1-articulate (*revazi*). Telson of ordinary length, fully cleft, apices tapering, spinose, type with basolateral spines.

Coxal gills 2–7, ovate to adze-shaped. Oostegites very broad.

Relationship.—Differing from *Echinogammarus* Stebbing in the very weak lobation of pereopods 5–7. Differing from *Zenkevitchia* Birstein in the normal outer plate of maxilla 1 not grossly modified for filtration, in the large palp of maxilla 1, the normally short inner plate of the maxilliped; from *Typhlogammarus* Schäferna, *Accubogammarus* G. S. Karaman and

Fontogammarus S. Karaman in the asymmetric palps of maxilla 1 bearing apical spines and from *Metohia* Absolon in the uncarinate body, variramous (not magniramous) uropod 3. *Ilvanella* Vigna-Taglianti differs from *Anopogammarus* in the parviramous uropod 3.

Anopogammarus revazi was originally described in *Zenkevitchia* but that genus is to be limited to species with the moplike maxilla 1 of filtering form in which dozens of spines occur on the outer plate and the palp is much reduced.

Species.—birsteini Derzhavin, 1945, *revazi* (Birstein and Levuschkin, 1970); Transcaucasus, hypogean, 2.

Tadzocrangonyx, Karaman and Barnard, new genus

Type-species.—Crangonyx schizurus Birstein, 1948 (here selected).

Name.—Crangonyx of Tadzhikistan. Neuter.

Diagnosis.—Body ordinary, urosomites free, with several short, stiff dorsal setae. Rostrum short, lateral cephalic lobes subrounded, anteroventral sinus weakly marked or absent. Eyes absent.

Antenna 1 longer than antenna 2, ratio of peduncular articles = 21:10:9, accessory flagellum 2-articulate. Antenna 2 ordinary.

Labrum entire, subrounded. Mandibular incisor toothed, molar triturative, palp 3-articulate, article 1 short, 2 longer than 3, latter falciform (as in *Gammarus*). Labium ungaped, inner lobes weakly marked or absent. Maxillae 1–2 strongly setose medially, outer plate of maxilla 1 with 8–10 toothed spines, palps asymmetric. Inner plate of maxilla 2 with oblique facial row of setae. Plates of maxilliped of medium size, outer reaching one half to two thirds along palp article 2, palp articles 2–3 elongate, slender, article 3 unlobed, dactyl unguiform, subapically setiferous.

Coxae of medium size, coxa 1 unproduced, lobe of coxa 4 weak or absent. Gnathopods large, subchelate, gnathopod 2 the larger, wrist shorter than hand, weakly lobed, hand large, palms oblique, not spinose (spines only at defining or subdefining corners).

Pereopods 3–4 ordinary. Pereopods 5–7 of medium size, 5 slightly the shortest, article 2 scarcely expanded basally, *Gammarus*-like, poorly or not lobed.

Inner ramus of pleopods slightly to greatly shorter than outer ramus. Uropods 1–2 well developed, rami subequal to each other or inner ramus the shorter (*schizurus*); basofacial armaments [unknown]. Uropod 3 exceeding apices of uropods 1–2, peduncle short, parviramous, inner ramus scale-like, outer ramus 1-articulate, spinose. Telson of ordinary length, deeply incised, ungaped, apices strongly spinose.

Coxal gills present, sternal gills absent. Oostegites [unknown].

Relationship.—Differing from *Crangonyx* Bate in the absence of bifurcate

spines and other spines on the palmar margins of the gnathopods (except at the defining corners), in the ungaped and deeply cleft telson, the higher number of spines on the outer plate of maxilla 1 (8–10 as opposed to 6–8), the slightly elongate articles 2–3 of the maxillipedal palp, and in the asymmetric palps of maxilla 1. The absence of sternal gills also occurs rarely in *Crangonyx*.

Tadzocrangonyx bears a superficial resemblance to *Protocrangonyx* Nicholls from Australia but differs in the absence of sternal gills, the incised telson, the higher number of spines on the outer plate of maxilla 1, the medially setose maxillae, and elongate uropod 3.

Species.—setiferum (Birstein and Levuschkin, 1972) (Tjan-Shan, Middle Asia, USSR, from bank of Atbashi River); *schizurum* (Birstein 1948) (Tadzhikistan, Hissar, spring); probably both species are hypogean but emerge accidentally into epigean waters.

Anisogammarus, Eogammarus, and *Spinulogammarus*

Anisogammarus and *Eogammarus* are retained as valid genera but *Spinulogammarus* is synonymized with *Eogammarus*. Actually the differences between *Anisogammarus* and *Eogammarus* are not as strong as heretofore presented in the literature, the two genera clearly differing only in the presence of a dorsal tooth or teeth on urosomites 1–2 in *Anisogammarus* and the absence of a tooth or teeth in *Eogammarus*.

Evidence and discussion: The genera and species are as follows according to Tzvetkova (1975a); these references are omitted from our Literature Cited:

1. *Anisogammarus* Derzhavin, 1927, type-species: *Anisogammarus dybovskyi* Derzhavin, 1927 (=*Gammarus pugettensis* Dana, 1853, =*Gammarus pribilofensis* Pearse, 1913); species: *macginitei* Shoemaker, 1955.
2. *Eogammarus* Birstein, 1933, type-species: *Gammarus kygi* Derzhavin, 1923 (selected by Tzvetkova, 1975); species: *aestuariorum* Tzvetkova, 1972; *barbatus* Tzvetkova, 1965; *confervicolus* Stimpson, 1856; *hirsutimanus* Kurenkov and Mednikov, 1959; *locustoides* Brandt, 1851; *makarovi* Bulycheva, 1952; *possjeticus* Tzvetkova, 1967; *ramellus* Weckel, 1907; *ryotoensis* Ueno, 1940; *schmidti* Derzhavin, 1927; *similimanus* Bousfield, 1961; *tiuschovi* Derzhavin, 1927; *turgimanus* Shen, 1955.
3. *Spinulogammarus* Tzvetkova, 1972, type-species: *Gammarus ochotensis* Brandt, 1851; species: *annandalei* Tattersall, 1922; *atchensis* Brandt, 1851; *jesoensis* Schellenberg, 1937; *oregonensis* Shoemaker, 1944; *spasskii* Bulycheva, 1952; *subcarinatus* Bate, 1862.

Tzvetkova (1975a) considered these genera to be subgenera of *Anisogammarus*.

Anisogammarus contains species with a large erect tooth (knob or tubercle) on urosomite 2 or urosomites 1 and 2 whereas *Eogammarus* and *Spinulogammarus* each lack this ornamentation. The type-species of *Anisogammarus* has an elongate inner ramus on uropod 3 (magni- or variramous) and *A. macginitei* Shoemaker (1955) has a slightly elongate inner ramus. Tzvetkova illustrated specimens with an adequately variramous uropod 3 but Shoemaker's original drawings show a much shorter inner ramus; we examined Shoemaker's original material in the USNM and confirmed that the inner ramus is longer than the definition attributed to parviramous and that Tzvetkova is correct in attributing to the subgenus *Anisogammarus* third uropods with stronger inner ramus than the parviramous kind. However, we must note that *A. macginitei* definitely represents an intergradation between parvi- and magniramous. We therefore find that the only incontestable difference between *Anisogammarus* and *Eogammarus* remains the urosomal tooth (teeth) of *Anisogammarus*.

Tzvetkova split the remaining species of the group, which theretofore had been assigned to *Eogammarus*, into 2 subgenera, *Eogammarus* and *Spinulogammarus*, based mainly on the presence of dorsal spination on the metasome in *Spinulogammarus* and its absence in *Eogammarus*. She also noted that most species of *Eogammarus* differed from most species of *Spinulogammarus* in the stronger setation of pereopods 5–7, uropod 3 and the telson, whereas in *Spinulogammarus* these appendages are furnished mainly with thick spines and few or no setae.

The presence or absence of dorsal spination on the metasome has been abandoned as a good character in other genera such as *Echinogammarus* and though this is no justification for its abandonment in *Eogammarus* and *Spinulogammarus*, the species actually show transition and therefore the distinction is invalid. For example, several species of *Spinulogammarus* lack spines on metasomite 1 and several species of *Eogammarus* have weak to strong dorsal setae on metasomites 2–3, the difference between spines and setae being only degree of thickness. A transitional sequence follows:

1. *S. annandalei* bears setae *or* spines on the metasome or lacks any setae or spines on the metasome, all phases depending on age.

2. *S. oregonensis, S. atchensis, S. ochotensis* are fully spinose on metasomites 1–3; a dorsal keel is present or absent.

3. *S. subcarinatus* is weakly spinose on metasomites 1–3 and also bears a dorsal keel.

4. *S. jesoensis* and *S. spasskii* lack spines on metasomite 1 but retain spines on metasomites 2–3.

5. *E. ramellus* bears setae on metasomites 2–3 and occasionally on metasomite 1.

6. *E. similimanus* bears setae on metasomites 2–3.

7. *E. confervicolus* lacks metasomal setae and keel.
8. *E. makarovi* lacks metasomal setae but bears a keel.

Other species lack setae but the keel is present or absent.

None of the other potential generic characters distinctly separates the two genera as seen in the following sequences:

Uropod 3.

1. Spines only: *S. spasskii, S. ochotensis.*
2. Spines and short setae: *S. atchensis, E. makarovi, S. subcarinatus, S. annandalei.*
3. Spines and longer or denser setae: *S. oregonensis, E. confervicolus* with setae increasingly longer or dense on *E. kygi, E. tiuschovi, E. schmidti, E. barbatus, E. hirsutimanus, E. aestuariorum.*

Pereopod 7.

1. Setae absent: *S. ochotensis, S. atchensis, S. subcarinatus, E. makarovi.*
2. Setae sparsely present: *E. aestuariorum.*
3. Setae well developed: *E. similimanus, E. ramellus, E. schmidti.*

Telson (in all cases spines are always present).

1. Setae absent: *S. spasskii, S. subcarinatus, S. ochotensis, S. atchensis, E. ryotoensis, E. possjeticus. E. kygi, E. locustoides.*
2. Setae weakly developed: *S. oregonensis, S. annandalei, E. tiuschovi, E. barbatus, E. schmidti,* etc.
3. Setae well developed: *E. hirsutimanus, E. makarovi, E. ramellus, E. similimanus.*

Eogammarus Birstein, new status and new synonymy

Eogammarus Birstein, 1933:149 (*Gammarus kygi* Derzhavin, 1923, selected by Tzvetkova, 1975a).

(*Spinulogammarus*) Tzvetkova, in Golikov and Tzvetkova, 1972:2; Tzvetkova 1972a:221; Tzvetkova 1972b:307 (*Gammarus ochotensis* Brandt, 1851, original designation). New synonym.

Anisogammarus Derzhavin (newly restricted)

Anisogammarus Derzhavin, 1927:8 (*Gammarus pugettensis* Dana, 1853 [=*Anisogammarus dybovskyi* Derzhavin, 1927, =*Gammarus pribilofensis* Pearse, 1913], monotypy).

not *Eogammarus* Birstein, 1933:149 (=valid genus).

not *Spinulogammarus* Tzvetkova, in Golikov and Tzvetkova, 1972:2 (=synonym of *Eogammarus*).

Eriopisa Stebbing, revised

Eriopis Bruzelius, 1859:64 (homonym, Insecta) (*Eriopis elongata* Bruzelius, 1859, monotypy).

Eriopsis Wrzesniowsky, 1890:632 (spelling error).
Eriopisa Stebbing, 1890:193 (replacement name); 1906:411 (same type-species).

Body vermiform to subvermiform, urosomites free. Rostrum obsolescent, lateral cephalic lobes rounded, with deep thin sinus (notch). Eyes absent.

Antennae elongate, antenna 1 much longer than antenna 2, ratio of peduncular articles = 24:26:8, accessory flagellum 2-articulate. Antenna 2 ordinary but flagellum short, articles free.

Labrum broader than long, entire or emarginate. Mandibular incisor toothed, molar triturative, ratio of palp articles = 4:11:16, article 3 linear, setae = ADE. Labium with small but fleshy inner lobes, gaping. Maxillae medially setose, inner plate of maxilla 1 ovatotriangular, fully setose medially, outer plate with 9 spines, palps almost symmetric. Inner plate of maxilla 2 with oblique facial row of setae. Outer plate of maxilliped medially setose, palp article 3 unlobed, dactyl about as long as 3, with nail.

Coxae very short, often discontiguous, coxa 1 sharp anteriorly, coxa 4 unlobed. Gnathopods 1–2 dissimilar, subchelate, gnathopod 2 enlarged, wrist of gnathopod 1 of medium length, ovate, unlobed, hand trapezoidal, expanding distally, palm oblique, wrist of gnathopod 2 short, weakly lobed, hand enlarged, elongate, ovate, palm very oblique, long, poorly defined, often sculptured; female gnathopod 2 smaller than male, palm simple.

Pereopods 3–4 ordinary. Pereopods 5–7 progressively longer but together not elongate, article 2 of pereopods 5–7 diverse, of 5 almost linear, of 6 slightly expanded, of 7 broadly expanded, 6–7 scarcely lobate.

Pleopods ordinary. Rami of uropods 1–2 equally extended, with marginal spines, peduncle of uropod 1 with basofacial spine, of uropod 2 [?with apicomedial comb]. Uropod 3 greatly extended, parviramous, outer ramus huge, article 2 also huge and nearly as long as article 1. Telson of ordinary length to elongate, deeply cleft, narrow, lobes tapering to apical notch, poorly spinose or setose.

Coxal gills 2–6, slender-ovate. Oostegites narrow.

Notes.—We reexamined the type-species and found the inner lobes of the lower lip complete and fleshy (contrary to Sars, 1895, sketchy depiction).

Relationship.—Differing from *Melita* in the elongate article 2 of the outer ramus on uropod 3, extremely thin body, and small coxae, with coxa 4 unlobed. All but type-species removed to genera following.

Species.—*elongata* (Bruzelius, 1859) (Sars, 1895); bathyal north Atlantic and Pacific (some Pacific specimens may be distinct species or subspecies of this genus).

Psammogammarus S. Karaman, revised

Psammogammarus S. Karaman, 1955:223 (*Psammogammarus caecus* S. Karaman, 1955, original designation).

Body vermiform to subvermiform, urosomites free. Rostrum obsolescent or small, lateral cephalic lobes rounded, shallow, sinus obsolescent. Eyes absent.

Antennae elongate, antenna 1 much longer than antenna 2, ratio of peduncular articles = 20:19:7, accessory flagellum 2-articulate. Antenna 2 ordinary but flagellum short, articles free.

Labrum broader than long, weakly emarginate. Mandibular incisor toothed, molar triturative, ratio of palp articles = 4:9:6, article 3 linear, setae = DE, very sparse. Labium with small but fleshy inner lobes partially fused together (like pleustids), gaping. Maxillae medially setose, inner plate of maxilla 1 ovate, not fully setose medially (3+ setae), outer plate with 9 spines, palps symmetric. Inner plate of maxilla 2 with oblique facial row of setae. Outer plate of maxilliped medially spinose (or only setose), palp article 3 unlobed, dactyl as long as 3, unguiform, nail absent or obsolescent.

Coxae very short, coxa 1 blunt anteriorly, coxa 4 unlobed. Gnathopods 1–2 subchelate, gnathopod 2 enlarged, wrist of gnathopod 1 of medium length, ovate, poorly lobed, hand weakly trapezoidal, weakly expanding apically, palm oblique, wrist of gnathopod 2 short, weakly lobed, hand enlarged, elongate, ovate, palm very oblique, poorly defined, often sculptured, female gnathopod 2 smaller than male, unsculptured, occasionally with weak hadziid setae.

Pereopods 3–4 ordinary. Pereopods 5–7 progressively longer, last one elongate, article 2 of pereopods 5–7 alike, scarcely expanded, almost linear, scarcely to strongly lobate.

Pleopods ordinary. Outer rami of uropods 1–2 slightly shortened, of uropod 1 lacking marginal spines, peduncle of uropod 1 with basofacial spine(s), of uropod 2 often with apicomedial comb. Uropod 3 highly extended, variramous or parviramous, outer ramus hugely elongate, article 2 usually as long as article 1 but occasionally much shortened. Telson weakly elongate, deeply cleft, apices sharp, spinose, often with lateral spines, main dorsal setules strongly apicad.

Coxal gills 3–6 on type-species, ovate to sausage-shaped. Oostegites [unknown on type-species].

Variants.—Species quite variable, for example: labrum rounded (*philippensis*); mandibular molar bulbous and poorly triturative (*gracilis*); article 3 of mandibular palp as long as article 2 (*seurati*); article 2 of antenna 1 shorter than article 1 (*gracilis*); lower lip normally melitid, with fully discrete fleshy inner lobes, no gape (*longiramus*); inner plate of maxilla 1 fully setose medially (*longiramus* and *seurati*); nail of maxilliped discrete and outer plate of maxilliped only setose medially (*philippensis*); gnathopod 1 palm transverse (*philippensis*) or parachelate (*seurati*); article 2 of pereopods 3–4 expanded (*philippensis*); article 2 of pereopods 5–7 well lobate (*philippensis*); uropods 1–2 poorly spinose (*gracilis*); inner ramus of uropod 3 as long as

article 1 of outer ramus (*longiramus*) or half as long (*caeca*); article 2 on outer ramus of uropod 3 short (*seurati*); telson broadened (*gracilis*).

Relationship.—Differing from *Eriopisa* in the lack of diversity on article 2 of pereopods 5–7 and the shorter article 3 of the mandibular palp, which in *Eriopisa* is much longer than article 2 and which in *Psammogammarus* is shorter than article 2.

Species.—*caecus* S. Karaman, 1955 (=*peresi* Ledoyer, 1968), *garthi* (J. L. Barnard, 1952), *gracilis* (Ruffo and Schiecke, 1976), *longiramus* (Stock and Nijssen, 1965), *philippensis* (Chilton, 1921b), *seurati* (Gauthier, 1936); cosmopolitan in low latitudes, anchialine or marine near brackish water, in wells or littoral, 6.

Victoriopisa Karaman and Barnard, new genus

Type-species.—*Niphargus chilkensis* Chilton, 1921a.

Name.—*Eriopisa* of Victoria, Australia. Feminine.

Body subvermiform, urosomites free, short. Rostrum very short, lateral cephalic lobes subrounded, with poorly marked anteroventral lobe, sinus obsolescent. Eyes weak or absent.

Antennae elongate, antenna 1 longer than antenna 2, ratio of peduncular articles = 29:26:7 (or article 2 longer, *epistomata*); accessory flagellum 2-articulate. First article of flagellum on antenna 2 elongate and composed of several articles fused together, total free articles about 2–3.

Labrum broader than long, entire, subrounded. Mandibular incisor toothed, molar triturative, ratio of palp articles = 4:11:16, article 3 linear, setae = DE. Inner lobes of labium partially fused together, obsolescent. Maxillae well setose medially, inner plate of maxilla 1 ovatotriangular, fully setose medially, outer plate with about 7 distal spines, palps [?symmetric][palp of *epistomata* shown to be 1-articulate]. Inner plate of maxilla 2 with several medial marginal setae only (none obliquely positioned). Outer plate of maxilliped medially spinose, article 3 of palp unlobed, dactyl shorter than 3, unguiform, nail weak or absent.

Coxae very short, discontiguous, coxa 1 not produced (or produced in *epistomata*), coxa 4 unlobed. Gnathopods 1–2 dissimilar, subchelate, gnathopod 2 enlarged, wrist of gnathopod 1 elongate, ovate, unlobed, hand trapezoidal, expanding distally, palm almost transverse but convex; wrist of gnathopod 2 short, weakly lobed or not lobed, hand enlarged, elongate, ovate, palm very oblique, long, poorly defined, slightly sculptured, dactyl elongate.

Pereopods 3–4 ordinary. Pereopods 5–7 almost equal in length and short, article 2 of pereopods 5–7 diverse, of 5 unexpanded and almost linear, of 6 weakly expanded, of 7 broadly expanded and lobate; *article 4 of pereopod 7 dilated* (unusual character).

Pleopods ordinary. Rami of uropods 1–2 subequally extended, with marginal spines, peduncle of uropod 1 with basofacial spine, of uropod 2 with weak apicomedial comb. Uropod 3 greatly extended, parviramous, outer ramus huge, article 2 also huge and nearly as long as article 1. Telson of ordinary length, cleft to base, lobes tapering, weakly armed apically or apicolaterally.

Coxal gills 2–6, some of them broadly pyriform. Oostegites [unknown].

Relationship.—Allied to *Eriopisa* Stebbing and *Psammogammarus* S. Karaman, but differing in the basal fusion of articles on the flagellum of antenna 2, the obsolescence of inner lobes on the labium, the absence of the oblique facial row of setae on maxilla 2, the dilated article 4 of pereopod 7, and the subequal pereopods 5 and 7.

Species.—*chilkensis* (Chilton, 1921a) (Chilka Lake, India); *australiensis* (Chilton, 1923) (New South Wales, tidal lagoon) (Victoria); *epistomata* (Griffiths, 1974) (South Africa, open sea).

Eriopisella sechellensis (Chevreux)

Eriopisa sechellensis Chevreux, 1901:403, figs. 19–23.—Stebbing, 1906:732. *Eriopisella sechellensis.*—K. H. Barnard, 1935:284, fig. 4.—Ruffo, 1959:6, fig. III, 1–2.—Nagata, 1965:304, fig. 33.—Sivaprakasam, 1969: fig. 3H–K. *Niphargus chilkensis.*—Chilton, 1925:534, fig. 1 (not Chilton, 1921b).

Article 2 of pereopod 7 varies from scarcely lobate in the typical material from the Seychelles Islands to moderately lobate in the Japanese material illustrated by Nagata.

The material identified as a new subspecies by J. L. Barnard (1970), as *E. sechellensis upolu* has article 2 of pereopod 7 completely unlobed. We intend treating all subspecies as full species in our forthcoming monograph so that *upolu* is removed to specific level even though its distinctions are very small.

Distribution.—Seychelles (type-locality); Japan to Red Sea, sublittoral.

Giniphargus Karaman and Barnard, new genus

Type-species.—*Niphargus pulchellus* Sayce, 1899.

Name.—*Niphargus* of Gippsland. Masculine.

Body subvermiform, urosomites free. Rostrum obsolescent, lateral cephalic lobes shallow, rounded, with sinus below and then bulbous corner extended. Eyes absent.

Antennae slightly elongate, antenna 1 scarcely longer than antenna 2, ratio of peduncular articles = 30:24:9; accessory flagellum 4-articulate. Article 4 of peduncle on antenna 2 slightly inflated, longer than article 5, flagellum ordinary, articles free.

Labrum broader than long, entire, rounded. Mandibular incisor toothed, molar triturative, ratio of palp articles = 10:18:15 (article 1 thus elongate), article 3 weakly falcate, setae = CDE. Inner lobes of labium discrete, small, fleshy. Maxillae moderately setose medially, inner plate of maxilla 1 ovate, with about 5 medial setae near apex, outer plate with about 8 serrate spines, palps [?symmetric]. Inner plate of maxilla 2 with oblique facial row of setae (as stated by description). Outer plate of maxilliped medially spinulate, article 3 of palp unlobed, dactyl shorter than 3, unguiform, with nail.

Coxae very short, barely touching each other, coxa 1 not produced, coxa 4 unlobed. Gnathopods 1–2 similar to each other, feeble, subchelate, mittenform, wrists unlobed, hands trapezoidal, small, expanding apically, palms transverse, short, wrist of gnathopod 1 of ordinary length, wrist of gnathopod 2 elongate, gnathopods otherwise identical in size.

Pereopods 3–4 ordinary. Pereopods 5–7 progressively longer than each other but together not of elongate form, article 2 unexpanded, ovatolinear, unlobate, dactyls apparently with only one setule on inferior margin.

Pleopods ordinary. Rami of uropods 1–2 extending subequally, marginally spinose, peduncle of uropod 1 apparently lacking basofacial spine. Uropod 3 greatly extended, of "parviramous" form because inner ramus absent, outer ramus huge, article 2 also huge and nearly as long as article 1. Telson short, broad, cleft halfway, apices broadly rounded, dorsally spinose.

Coxal gills 2–6, ovoid, pedunculate, 2-articulate. Oostegites [unknown].

Relationship.—Differing from *Indoniphargus* Straskraba (1967) and *Micropniphargus* Schellenberg (1934) in the absence of a lobe on wrist of gnathopod 1; from *Eriopisella* Chevreux in the absence of the inner ramus on uropod 3, the presence of an oblique setal row on maxilla 2, elongate article 2 on outer ramus of uropod 3, and, additionally, in the absence of a lobe on the wrist of gnathopod 2.

Species.—pulchellus (Sayce, 1899); Australia, Victoria, Gippsland, presumed hypogean, 1.

Pygocrangonyx Karaman and Barnard, new genus

Type-species.—Metacrangonyx remyi Balazuc and Ruffo, 1953.

Name.—Pygidized *Crangonyx*. Neuter.

Body [?slender], urosomites free, naked. Rostrum obsolescent, lateral cephalic lobes subrounded, sinus [?present]. Eyes absent.

Antennae elongate, antenna 1 longer than antenna 2, ratio of peduncular articles = 20:16:12, accessory flagellum [?2-articulate]. Antenna 2 ordinary.

Labrum entire, broader than long, rounded apically. Mandibular incisor toothed, molar triturative, palp vestigial, 1-articulate, setae = E. Labium without inner lobes. Maxillae 1–2 fully setose medially, inner plate of max-

illa 1 triangular, outer plate with 10 spines, palps asymmetrically armed. Inner plate of maxilla 2 with oblique facial row of setae. Both plates of maxilliped of medium size, outer plate [?medially spinose], palp article 3 unlobed, dactyl [?unguiform, ?with apical nail].

Coxae elongate, [?with short to medium setae], coxa 1 not expanded, coxa 4 unlobed, [?coxa 5 shorter than 4]. Gnathopods feeble, gnathopod 1 of *Melita* form, article 5 elongate, palm transverse; gnathopod 2 slightly larger, both articles 5 and 6 elongate and thin, palm very oblique, armed with bifid spines, posterior margin of hand with long curved hadziid-like setae. No sexual dimorphism.

Pereopods 3–4 ordinary. Pereopod 7 slightly longer than pereopod 5, article 2 of pereopods 5–7 lobate or not (7), weakly to strongly expanded, dactyls simple.

Pleopods and uropods 1–2 ordinary, basofacial spine of uropod 1 [unknown]. Uropod 3 uniramous, very short, peduncle large, broader and longer than ramus; inner ramus absent, outer ramus 1-articulate, weakly longer than broad, stout, with 5 very long distal spines much longer than ramus itself. Telson very short, entire, broader than long, with 2 long distal spines longer than telson plus several setules.

Coxal gills 2–6, narrow. Oostegites [unknown].

Relationship.—Alled to *Metacrangonyx* Chevreux (1909) but differing by the loss of the inner ramus on uropod 3, the much shortened outer ramus, the elongate distal spines on that ramus (1–2 shorter spines found in *Metacrangonyx*), the presence of long spines on the telson (setae in *Metacrangonyx*) and by the absence of a lobe on article 2 of pereopod 7. These genera are not crangonyctids.

Species.—remyi (Balazuc and Ruffo, 1953); Morocco, hypogean, 1.

Dulichiella Stout, revived

Dulichiella Stout, 1912:140 (*Dulichiella spinosa* Stout, 1912, monotypy).

Body somewhat slender, urosomites free, metasomites and urosomites transversely crenulated or toothed dorsally. Rostrum short, lateral cephalic lobes subquadrate, sinus present. Eyes present.

Antennae elongate, well setose, antenna 1 longer than antenna 2, ratio of peduncular articles = 16:18:4, ratio of flagella = 63:12, accessory flagellum multiarticulate (5-articulate in type). Ratio of peduncular articles 3,4,5 and flagellum on antenna 2 = 6:16:14:28.

Labrum ["slightly bilobed"]. Mandibular incisor toothed, molar triturative, ratio of palp articles = 3:8:10 (approximate), article 3 weakly clavate, setae of article 3 = ADE. Inner lobes of lower lip well developed, fleshy. Maxillary setae diverse; inner plate of maxilla 1 long, narrow, tapering,

curved, with 1–2 strong apical plumose setae, medially margin hairy, outer plate with 9 spines, palp 2-articulate [symmetricity unknown]. Inner plate of maxilla 2 with oblique facial row of setae. Outer plate of maxilliped medially serrate and finely spinulose, article 3 of palp unlobed, dactyl unguiform, nail weak.

Coxae medium to short, moderately setose, coxa 1 scarcely expanded apically, coxa 4 poorly lobed and scarcely longer than coxa 5. Gnathopods subchelate, gnathopod 1 small, of *Melita* form, wrist elongate, unlobed, hand shorter than wrist, palm almost transverse; female gnathopod 2 slightly enlarged, wrist of same length as gnathopod 1 but hand much longer than wrist (thus wrist short), wrist scarcely lobate, palm weakly oblique, short, article 4 with tooth; one side (right or left) male gnathopod 2 like female gnathopod 2; other male gnathopod 2 (right or left) immensely enlarged and chelate, as in fiddler crabs, resembling crab claw, articles 3–5 tiny, hand immense, with giant chela, dactyl immense and thick, closing on transversely extended palm.

Pereopods 3–4 ordinary. Article 2 of pereopods 5–7 scarcely expanded, scarcely lobate ventrally.

Pleopods ordinary. Rami of uropods 1–2 extending equally, marginally spinose, uropod 1 with basofacial spine on peduncle. Uropod 3 extended, parviramous, outer ramus elongate, article 2 short. Telson of ordinary length, cleft to base, but partially gaping, apically and laterally spinose.

Coxal gills [?2–6, ovate]. Oostegites [?slender].

Relationship.—Like *Melita* but male gnathopod 2 of strong diversity from right to left sides, part of body with numerous transverse dorsal serrations, inner plate of maxilla 1 with sickle form and bearing only 1–2 fully apical setae.

The species of this genus have been included with *Melita* since the late part of the 19th Century; Stout accidentally described this genus on the mistaken idea that uropod 3 lacked rami (because they had broken off) and thus compared the genus with *Dulichia*. Since Stout's time the genus has always been synonymized with *Melita* but we believe the unusual male gnathopods analogous to those of a fiddler crab deserve generic recognition. In this way we also believe that the several species heretofore synonymized with *Melita fresneli* or *M. appendiculata* must be revived, reexamined and redescribed as there may be several valid species. For the moment, then, we revive the following species.

Species.—*appendiculata* (Say, 1818); *australis* (Haswell, 1879) *exilii* (Fritz Müller, 1864); *fresneli* (Audouin, 1826) (?=*cotesi* Giles, 1890) (?=*validus* Dana, 1852) (=*pilosus* Dana, 1852) (=?*setipes* Dana, 1852), (=?*anisochir* Krøyer, 1845), (?=*valida* Dana, 1852); *spinosa* Stout, 1912; tropicopolitan in shallow seas, ?5+.

Quadrivisio Stebbing
Quadrivisio bousfieldi, new species

Quadrivisio bengalensis Bousfield, 1971:260–263, figs. 3, 4.

Name.—Named for E. L. Bousfield, describer of the material.

Accessory flagellum with 6–7 articles. Mandibular palp articles 2–3 asetose. Article 6 of male gnathopod 1 evenly rectangular. Epimera 1–3 with 1–2 posterior teeth each in addition to normal posterodistal tooth. Telson with 3 spines on each lobe but inner margins of lobes lacking armament.

Holotype.—Female, ovigerous, 9 mm (figures 3–4 of Bousfield 1971).

Type-locality.—Bismarck Archipelago, Manus Island, Liei River, outlet, 19 June 1962.

Relationship.—This species differs from *Q. bengalensis* Stebbing, 1907 (and see Rabindranath, 1972; Nayar, 1959) by the absence of inner armaments on the telson, the absence of setae on distal palp articles of the mandible, and by the presence of 1–2 posterior teeth on epimera 1–3 in addition to the posterodistal tooth.

Quadrivisio bousfieldi differs from *Q. lutzi* (Shoemaker, 1933) by the absence of setae on the apex of the mandibular palp, the presence of supernumerary teeth on the epimera and in the shape of the lateral cephalic lobes.

The new species differs from *Q. aviceps* K. H. Barnard (1940) in the supernumerary epimeral teeth and the presence of 3 spines (not 1) on each lobe of the telson. See the key to species below.

Key to the Species of *Quadrivisio*[5]

1. Epimera 1–3 each with 1–2 posterior teeth besides normal posterodistal tooth, palp articles 2–3 of mandible without setae ..... *Q. bousfieldi*
– Epimera 1–3 lacking supernumerary teeth, palp articles 2–3 of mandible with 1–2 setae each 2
2. Telson with spines or setae along inner margin of each lobe ..... *Q. bengalensis*
– Telson without spines or setae along inner margin of each lobe 3
3. Accessory flagellum with 11–12 articles; article 6 of gnathopod 1 in males dilated distally ..... *Q. aviceps*
– Accessory flagellum with 4–6 articles; article 6 of gnathopod 1 in males tapering distally ..... *Q. lutzi*

Nainaloa Karaman and Barnard, new genus

Type-species.—*Melita latimerus* Bousfield, 1971.

Name.—Contrived. Feminine.

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[5] *Quadrivisio chevreuxi* Gordon and Monod (1968), is omitted because most of the key characters remain undescribed.

Body ordinary, smooth, urosomites free, urosomite 2 with 2 dorsal spines. Rostrum obsolescent, lateral cephalic lobes subrounded, prominent, anteroventral sinus present. Eyes present.

Antennae elongate, antenna 1 longer than antenna 2, peduncle almost slender, ratio of peduncular articles = 29:29:17; accessory flagellum 2-articulate. Antenna 2 ordinary.

Labrum entire, with weakly extended epistome in front. Mandibular incisor toothed, molar triturative, palp slender, 3-articulate, articles 2 and 3 subequally long, article 3 with 3 apical setae (E). Labium ordinary, with small fleshy inner lobes. Maxillae 1–2 not medially setose, inner plate of maxilla 1 with 3 apical setae, outer plate with 9 serrate spines, palp ordinary, 2-articulate, with distal setae and spines. Both plates of maxilla 2 narrow, inner lacking oblique facial row of setae. Both plates of maxilliped of medium size, outer plate setose along inner margin, palp article 2 elongate, article 3 short, slightly lobed, article 4 as long as article 3, unguiform, nail [unknown].

Coxae of medium size, coxa 1 not expanded, coxa 4 with shallow posterodistal lobe. Gnathopods strongly diverse, subchelate, sexually dimorphic: article 5 of gnathopod 1 slightly longer than article 6, unlobed, palm transverse; gnathopod 2 enlarged, but weakly so in female, article 5 short to very short, with broad to narrow lobe, article 6 large, ovoid, palm strongly oblique, poorly defined.

Pereopods 3–4 ordinary. Pereopods 5–7 not elongate, pereopod 5 weakly shorter than pereopod 7, article 2 of all expanded, ovoid, lobate.

Pleopods weak but rami multiarticulate. Uropod 1 slightly reduced, [?apparently without basofacial spine], outer ramus slender, naked dorsally, inner ramus slightly elongate, dorsally spinose. Uropod 2 ordinary, reaching as far as uropod 1, rami normally spinose. Uropod 3 strongly exceeding uropod 1, parviramous, peduncle shorter than outer ramus, inner ramus scale-like, outer ramus rectangular, with medium article 2. Telson short, cleft to base, each lobe quadrate, weakly excavate apically, weakly spinose.

Gills simple, 2–6, ovate to linear, not strongly pediculate. Oostegites narrow.

Relationship.—Allied to *Rotomelita* J. L. Barnard (1977), but differing from it in the partly reduced uropod 1, subequally long pereopods 5–7, simple gills, sexual dimorphism of gnathopod 2, lobed article 2 of pereopods 5–7, presence of eyes and prominent lateral cephalic lobes.

Species.—*latimerus* (Bousfield, 1971); Bismarck Archipelago, brackish lakes and lagoons.

Gammarella Bate, new synonymy

Pherusa Leach, 1814:432 (homonym, Polychaeta) (*Pherusa fucicola* Leach, 1814, monotypy).

Gammarella Bate, 1857:143.—Stebbing, 1906:449 (*Gammarella orchestiformis* 1857, monotypy, =*Pherusa fucicola* Leach).

Pherusana J. L. Barnard, 1964:62 (new name for *Pherusa,* same type-species).

Nuuanu J. L. Barnard, 1970:166 (*Nuuanu amikai* J. L. Barnard, 1970, original designation). New synonym.

Cottesloe J. L. Barnard, 1974:27 (*Cottesloe berringar* J. L. Barnard, 1974, original designation). New synonym.

Body laterally compressed, carinate or smooth, urosomites free, carinate or smooth, weakly spinose, urosomite 2 often with pair of dorsal spines. Rostrum short, lateral cephalic lobes acute at upper corner but actually forming large quadrate extension with narrow incision. Eyes present but often poorly developed.

Antennae elongate to medium, joints often geniculate, peduncular article 1 slender to stout, article 2 longer or shorter than article 1, article 3 shorter than 2; typical ratio of articles = 26:30:10, accessory flagellum 3+-articulate. Antenna 2 thin, shorter than antenna 1.

Labrum broader than long, subrounded, entire. Mandibular incisor toothed, molar triturative, palp article 1 weakly to strongly elongate, article 2 slender, elongate, article 3 falcate, shorter than or equal to article 2, typical ratio = 5:14:11, setae = DE. Inner lobes of labium absent or faintly marked. Maxillae strongly setose medially, inner plate of maxilla 1 leaf-like or subtriangular, heavily setose medially, outer plate with 9 spines, palps asymmetric, 2-articulate. Inner plate of maxilla 2 with oblique facial row of setae. Maxillipedal plates large, outer medially spinose, palp strong, article 3 unlobed, dactyl shorter than 3, unguiform, with weak nail.

Anterior coxae of medium extension, or long, coxa 1 scarcely expanded apically, coxa 4 lobed (coxa 3 rarely shortened), coxa 5 shorter than 4. Gnathopods subchelate, of female almost feeble, dissimilar, almost of equal size, wrists elongate, unlobed, hands narrow, rectangular or subrectangular, palm of gnathopod 1 usually transverse, of gnathopod 2 oblique and often obsolescent; male gnathopod 1 like female, male gnathopod 2 greatly enlarged, wrist very short, cryptic (type) or strongly lobed, hand elongate, ovate, palm oblique and long or merging with posterior margin, dactyl elongate, curved, or short and stout.

Pereopods 3–4 ordinary. Article 2 of pereopods 5–7 usually strongly serrate posteriorly (but not in type), otherwise dissimilar in shape, of pereopods 5–6 weakly expanded, tapering distally, moderately lobate posteroventrally, of pereopod 7 broadly expanded, shield-like, these pereopods usually short, pereopod 6 often slightly the longest.

Pleopods ordinary. Rami of uropods 1–2 extending equally, spinose marginally, uropod 1 with basofacial spine. Uropod 3 not extended, parvira-

mous, inner ramus occasionally however with medial spine(s), outer ramus short (thus making inner ramus appear much larger than it is relative to genera such as *Melita*), spinose, article 2 small (possibly absent in male of type-species). Telson short, deeply cleft, lobes tapering sparsely, spinose apically.

Coxal gills 2–6, ovate, not pediculate. Oostegites slender.

Variants.—Articles of peduncle on antenna 1 often fixed in geniculate fashion in preserved material (especially species of *Nuuanu*); article 2 of antenna 1 varying between 0.55 and 1.25 times length of article 1; article 2 of pereopods 5–7 scarcely serrate (*fucicola*), or strongly serrate (all other species); urosomite 1 with dorsal tooth (*fucicola, berringar*) or not (most other species); body cuticle with straw-setules (*fucicola,* species of *Nuuanu*) or villose (*berringar, merringannee*).

Remarks.—When *Nuuanu* was originally described, its affinity with *Gammarella* was overlooked because of the much more strongly developed expansions and serrations on pereopods 5–7 and the strange head shape not previously noted for *Gammarella* except by Sowinsky (1898) and overlooked by Barnard. Then *Cottesloe* was established with affinities to *Nuuanu* but strong differences in antenna 1 article ratios, cuticle texture but especially robust body size and opaque cuticle (latter as seen in retrospect). Finally, *Tabatzius* McKinney and Barnard (1977) was described on the basis of parasitic maxillae and a specimen of *Gammarella* reappraised. We have now examined more specimens of *G. fucicola* and have concluded, despite a wide variety of urosomal teeth, cuticles, antennae, eyes, robust bodies, pereopodal shapes and serrations, that no discontiguity exists among *Gammarella, Nuuanu* and *Cottesloe*. One species, *Nuuanu mokari* J. L. Barnard (1974) has a much shortened coxa 3 and could be elevated to generic status but we reserve this action until more exploration in the IndoPacific disproves any intergradation for that character. Meanwhile *Tabatzius* is retained but without strong conviction as it may also be found to have intergradational relatives yet undiscovered.

Species.—*amikai* (J. L. Barnard, 1970), *berringar* (J. L. Barnard, 1974), *fucicola* (Leach, 1814) (Sowinsky, 1898; Chevreux and Fage, 1925, but not well depicted), *merringannee* (J. L. Barnard, 1974), *mokari* (J. L. Barnard, 1974), *numbadi* (J. L. Barnard, 1974); eastern Atlantic, Mediterranean, Indo-Pacific especially Australia and Hawaii (as yet explored), 6.

Tabatzius McKinney and Barnard, emended

Tabatzius McKinney and Barnard, 1977:163 (*Tabatzius copillius* McKinney and Barnard, 1977, original designation, =*Nuuanu muelleri* Ortiz, 1976).

Tabatzius muelleri (Ortiz), new combination, new synonymy

Nuuanu muelleri Ortiz, 1976:13, figs. 1–3.
Tabatzius copillius McKinney and Barnard, 1977:164, figs. 1–3. New synonym.

Remarks.—The name proposed by Ortiz takes priority over *T. copillius*. In McKinney and Barnard (1977, fig. 3) the middle gnathopod labeled "G2" should be labeled "G2c."

Afridiella Karaman and Barnard, new genus

Type-species.—*Bogidiella somala* Ruffo, 1970.
Name.—Contrived, from Africa. Feminine.

Body [?subvermiform], urosomites [?free]. Rostrum obsolescent, lateral cephalic lobes [?subrounded, ?sinus present]. Eyes absent.

Antennae elongate, antenna 1 longer than 2, ratio of peduncular articles = 23:22:12, accessory flagellum 2-articulate, primary flagellum slightly shorter than peduncle. Antenna 2 ordinary.

Labrum [?entire, rounded]. Mandibular incisor weakly toothed, connected to large excavate callus, molar small, conical, not triturative, with strong comb and long seta, ratio of palp articles = 7:12:6, article 3 linear, setae = E. Labium [?almost gaping, inner lobes fused together]. Maxillae not medially setose, inner plate of maxilla 1 onion-shaped, with 2 apical setae, outer plate with 7 spines, palp apically slender, sparsely setose. Inner plate of maxilla 2 lacking facial and medial setae. Plates of maxilliped small, outer medially setose very sparsely, palp strong, article 3 unlobed, dactyl as long as 3, unguiform, with nail.

Coxae short, but longer than broad, coxa 4 unlobed, coxa 5 [?as long as 4 and rather large]. Gnathopods large, gnathopod 1 scarcely larger than 2, wrists short to medium respectively, strongly to moderately lobed respectively, hands elongate, slightly larger on gnathopod 1, palms very oblique, lined with short setae, poorly defined, somewhat longer on gnathopod 2, dactyls elongate.

Pereopods 3–4 ordinary, article 2 not dilated. Article 2 of pereopod 5 almost rectilinear, weakly expanded on pereopods 6–7, unlobate, dactyls short; article 6 of pereopods 5–7 anteriorly setose.

Pleopods with vestigial inner ramus, outer ramus short, 3-articulate. Rami of uropods 1–2 extending equally, without marginal spines, peduncle of uropod 1 with basofacial or ventrolateral spines. Uropod 3 extended, magniramous, rami elongate, 1-articulate, almost aequiramous. Telson short, broad, scarcely emarginate, with distal and apicolateral spines on each side.

Coxal gills 4–6, ovate. Oostegites small, geniculate, dense setae confined apically.

Relationship.—Differing from *Bogidiella* Hertzog (1933) in the excavate mandibular callosity, the strongly spinose molar, elongate palp article 1 of

the mandible, and slightly enlarged coxae. See following key for generic position.

Species.—somala (Ruffo, 1970); Somalia, hypogean, 1.

Key to the Genera of "Bogidiellids"

1. Uropod 3 uniramous ..... *Pseudingolfiella*
– Uropod 3 biramous 2
2. Uropod 3 parviramous ..... *Paracrangonyx*
– Uropod 3 magniramous 3
3. Uropod 1 uniramous ..... *Bollegidia*
– Uropod 1 biramous 4
4. Outer rami of pleopods 1-articulate ..... *Kergueleniola*
– Outer rami of pleopods multiarticulate 5
5. Coxae shorter than broad, often discontiguous or barely touching 6
– Coxae longer than broad, several coxae strongly overlapping .... *Spelaeogammarus*
6. Mandibular incisor ordinary, molar weakly to strongly triturative, not spinose or poorly spinose ..... *Bogidiella*
– Mandibular incisor with large excavate callosity, molar not triturative, strongly spinose ..... *Afridiella*

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